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Volume III Medical Works

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NON-CASEOUS TUBERCULOSIS OF THE THYROID GLAND

REPORT OF A CASE

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NON-CASEOUS TUBERCULOSIS OF THE THYROID GLAND

REPORT OF A CASE

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TUBERCULOSIS of the thyroid gland, though rare, occurs more frequently than was once thought. Careful microscopic study of resected thyroid tissue probably accounts for the apparent increase in incidence.

Rankin and Graham reported a group of cases several years ago, a large percentage of which presented symptoms of hyperthyroidism and were found to have high basal metabolic rates. Microscopic examination of the gland revealed the structure typical of exophthalmic goiter associated with the tuberculous involvement in many cases. Usually tubercles and giant cells were seen. A few cases of tuberculous thyroiditis unassociated with adenomas and hypertrophic changes were found. No pulmonary tuberculosis was found in any of these cases, and the original focus could not be determined; the authors concluded that it was too small to find. However, it seemed logical that the thyroid gland was invaded secondarily, probably as a result of tuberculous bacillemia. Van Ravenswaay and van Ravenswaay concur with Rankin and Graham that a diagnosis can be made from the microscopic picture with a high degree of accuracy. Most writers disagree with Cohen who stated that the diagnosis should be made clinically.

CASE REPORT

A 60 year old white woman was seen July 29, 1937. She complained of a lump in the right side of her neck, which she had first noticed about six months before. It had gradually increased in size since that time.

She had been hoarse since 1904, but the degree of hoarseness varied from time to time. She had always been thin and had frequent colds with a great deal of sputum. A pelvic tumor was removed in 1916. She had been told that she had pulmonary tuberculosis in 1920, but had taken no treatment. In 1923 another examination revealed "pulmonary tuberculosis with many cavities" and "heart trouble." However, she went on teaching school.

She had been told that the deaths of two of her sisters, each at the age of 23 years, had been due to tuberculosis, but she had not lived with them for several years prior to their deaths.

Examination revealed the patient to be underweight by about 20 pounds. Her temperature was 98.6; pulse 100; blood pressure 150/100. There were no eye signs indicative of exophthalmic goiter. The larynx and vocal cords were normal. The right lobe of the thyroid gland was enlarged and very hard, and seemed to be attached to the thyroid cartilage. The heart was normal and there were harsh breath sounds present over both apices. The abdomen was negative except for a low midline scar. Pelvic examination was essentially negative. *X*-ray of the chest showed, old fibrotic changes in both apices and at the left costophrenic angle. No areas of soft tissue infiltration suggestive of active tuberculosis were detected in the lung fields. The density of the lung fields suggested an emphysematous condition. Blood studies showed hemoglobin 89 per cent, 4,120,000 red blood cells, 4,850 white blood cells, 78 per cent polmorphonuclear leukocytes, 19 per cent small lymphocytes, 3 per cent large lymphocytes. An uncatheterized urine specimen contained an occasional pus cell. The basal metabolic rate was minus 9.

A diagnosis of adenomatous goiter without hyperthyroidism was made. It was felt that the adenoma had probably become malignant.

On August 2, under local and gas anesthesia, the entire right lobe, isthmus and one-half of the left lobe were resected. The right lobe was very adherent to the muscles and trachea. The

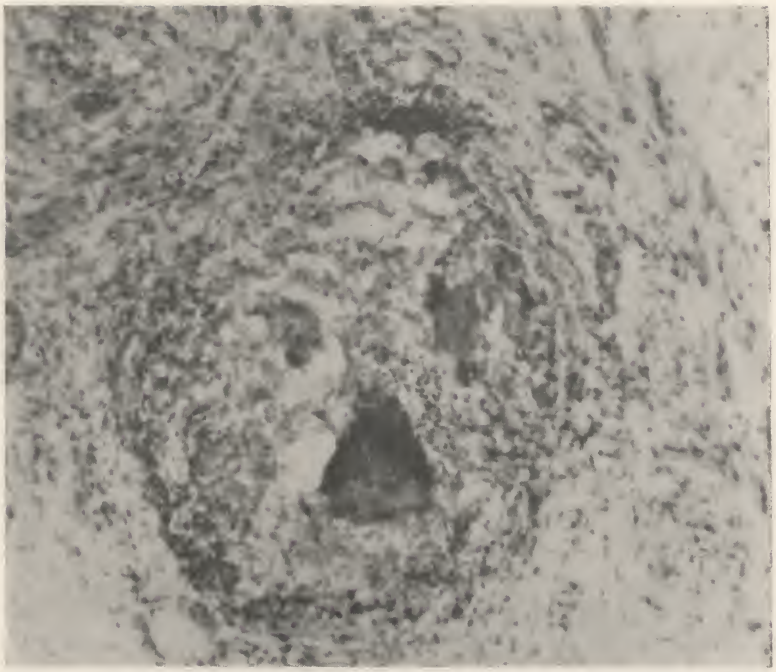

Fig. 1. Section of thyroid gland showing non-caseous tuberculosis. (High power.)

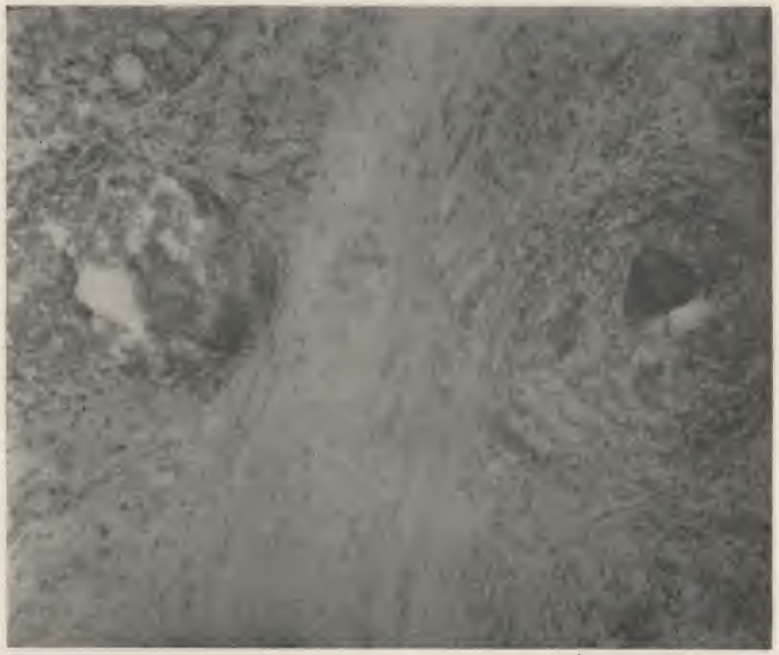

Fig. 2. Section of thyroid gland showing non-caseous tuberculosis. (Low power.)

resected thyroid tissue measured 5 × 4 × 3 cm. and grossly was grayish-white in color and very firm in consistency. The microscopic sections showed a diffuse non-caseous tuberculosis.

The immediate postoperative course was uneventful. The wound healed promptly, but the hoarseness has persisted as before though there is normal movement of the vocal cords.

This case is of unusual interest in that it gives a more definite clue to the primary site of infection than most others reported. Two and one-half months following operation symptoms of a mild hypothyroidism developed and the basal metabolic rate was found to be minus 16. Administration of desiccated thyroid gr. 1 daily brought the rate up to normal and since that time ½ gr. daily suffices. The patient feels well and carries on her regular teaching duties.

CONCLUSIONS

1. Tuberculosis of the thyroid is rare.
2. Most cases have associated hyperthyroidism.
3. The diagnosis is almost never made clinically.
4. The prognosis is usually good.
5. The case presented is of unusual interest in that it gives a more definite clue to the primary site of infection than most others reported. The pulmonary tuberculosis has apparently healed. There has never been any evidence of laryngeal tuberculosis. There was no hyperthyroidism. The wound healed readily without prolonged drainage. With the exception of a mild hypofunction of the remaining portion of thyroid tissue, which is easily controlled by the administration of desiccated thyroid, the patient is in good health.

Fig. 3. Recent roentgenogram of chest showing fibrosis in both bases and no evidence of active tuberculosis in the apices.

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Peptic Ulcer-Surgical Considerations

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Peptic Ulcer-Surgical Considerations*

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In dealing with peptic ulcer it is important to clearly distinguish between the kind as to location, for although there are many things clinically and pathologically that are alike, there are likewise many distinct differences.

Duodenal ulcer occurs nine times more commonly than gastric ulcer, and five times more commonly than gastric carcinoma. Duodenal ulcer is fairly common. Gastric ulcer is relatively uncommon. Many of you with large private practice will possibly see one gastric ulcer a year, and probably not more than two gastric cancers.

Ulcers in the stomach respond and heal more kindly than duodenal ulcers. Ulcers in the stomach may be malignant or may become malignant. Ulcers in the duodenum never become malignant. It is a well-known fact that the clinician, the x-ray man, and even the surgeon with the lesion in hand cannot be sure that an ulcerating lesion in the stomach is not malignant. Even the pathologist may have to make repeated sections. This point must constantly be borne in mind in dealing with any gastric ulcer regardless of size.

Gastric ulcers will heal without leaving any roentgen deformity. A duodenal ulcer that has healed will leave a duodenal deformity practically without exception.

We usually can make a clinical diagnosis of ulcer, but have to depend upon the roentgenologist to give the anatomical diagnosis. He usually can locate it and give its size, and frequently, in case of gastric ulceration, predict pathological characteristics.

The peptic ulcer problem is primarily a medical one, since 75% to 80% of them can be satisfactorily controlled medically. In discussing the surgical phases it is important not only to emphasize the surgical indications but also the types of operation that will afford the best chance of complete relief.

Complicated ulcers and the ones not responsive to medical management become surgical problems. The acutely perforated ulcer really requires little discussion except to say that operation without delay is important. At times a certain clinical diagnosis cannot be made. The important thing to realize is that an acute surgical abdomen exists and that no time should be delayed. One may open the abdomen expecting to find an acute gall bladder and find a perforated ulcer. The correct pathological diagnosis can be made at the operating table. The risk is small if the operation is done promptly. I have always favored simple closure with drainage. No doubt gastro-enterostomy can be done safely in the early cases with not much increase in risk, but I believe in doing the most simple procedure possible. Some of the acutely perforated cases will have no further trouble, but must follow a medical regimen for a time. Occasionally the ulcer will perforate the second time. Many will require further surgical attention later.

The subacute or chronic duodenal or gastric ulcer usually manifests itself clinically by reference of pain through to the back or up under the shoulder blade. In fact, a few gall bladders have been removed for supposed gall bladder disease whereas the pathology was an ulcer perforating into the pancreas. My attention was clearly called to this in a case in which I diagnosed common duct stone in a patient whose gall bladder had been removed. The internist, in checking the case over, called my attention to the fact that pain occurred at 11:00 a. m., 4:00 p. m., and 2:00 a. m. X-rays showed a duodenal deformity, and a perforating duodenal ulcer was found at operation. Such experiences as these lead us to examine carefully the stomach, duodenum, and gall bladder when operating for chronic intra-abdominal disease.

Obstruction usually follows prolonged periods of ulcer activity alternate with healing. In duodenal ulcer the duodenum becomes narrowed and shortened. Frequently it occurs later in life and, due to the obstruction with retention, the gastric glands become atrophied; so consequently the acids are lower and the case is an ideal one for gastro-enterostomy. In the obstructed cases there is an alteration in blood chemistry, so that they have to be prepared carefully for surgery. If the obstruction is prolonged an alkalosis may develop and at times this may go on to a state of gastric tetany, toxic nephritis and death. Adequate preparation consists of gastric lavage, large doses of intravenous glucose in saline to raise the blood chlorides and lower the blood urea.

In dealing with acute hemorrhage from a peptic ulcer we must realize that most of them will survive their bleeding. Each case must be handled individually. Certainly medical and surgical procedures are not competitive. Cooperation is most essential in dealing with this group of individuals. Most of them

*Read before the Harris County Medical Society

can be handled medically. In the individual whose life is endangered by exsanguination or in an individual who has had one hemorrhage and in a day or two has another, surgery will be indicated and should not be delayed. This is particularly true if the patient is over forty years of age. In recurrent hemorrhages surgery is indicated, and it is advisable to remove the ulcer if possible.

In addition to these usual surgical indications, we are also at times confronted with the intractable ulcer, or the patient who, because of occupation or position, cannot stay on a medical regime. Examples of these are farmers, laborers, railroad men, etc. They find it inconvenient to be on frequent feedings so, from an economic standpoint, they should accept surgery early if their symptoms are troublesome. Little can be accomplished in dealing with an ulcer if other pathology exists in the abdomen, such as appendicitis or cholecystitis.

The third type of ulcer that we occasionally have to deal with is the jejunal ulcer in a patient who has had a gastro-enterestomy. There are certain interesting things about a jejunal ulcer. The pain is usually to the left and lower than that of other peptic ulcers. It has a tendency to mimic the original ulcer. In other words, if the original ulcer tended to bleed or perforate, so is the jejunal apt to do likewise. Jejunal ulcer almost invariably occurs after gastro-enterostomy for duodenal ulcer, and rarely after gastro-enterostomy for gastric ulcer. They will occasionally occur after extensive gastric resection for ulcer. They practically never occur after gastric resection for carcinoma. In dealing with these lesions, which are practically always surgical, it is best to disconnect the gastro-enterostomy and do a partial gastrectomy. In some cases it may be advisable to take down the gastro-enterostomy and do a pyloroplasty, thus normal gastro-intestinal continuity is restored. Some patients will develop a jejunal ulcer in a resected stomach, and in those individuals who are usually chronic recurrers in spite of any operation, anastomosis of the stomach to the duodenum is advisable. Peptic ulcers may occur in other parts of the gastro-intestinal tract as in the ileum where the ileum was wrongly anastomosed to the stomach. Peptic ulcer of the esophagus occasionally occurs. Jackson has reported a number of cases. Vanzant, Daily, and myself recently reported one which led to obstruction of the lower end of the esophagus, and required gastrostomy before healing took place.

In reviewing 126 cases, a number which represented all peptic ulcers that were admitted to Memorial Hospital between 1934 and 1937, it was found that 35 were admitted because of bleeding. Twenty were over 40 years of age; 11 under 40, and there was one death in this series; 38 were admitted for diagnostic and medical supervision; 20 were admitted to have an elective surgical procedure carried out. Four of the perforations had or had had a perforation from six months to four years after the first closure.

In a personal series of cases operated in the past five years, 13 gastro-enterostomies were done for duodenal ulcer; four resections were done fo duodenal ulcer, and five gastric resections were done for gastric ulcer, while eight miscellaneous operations were done on the stomach for ulcer.

The surgical risk for peptic ulcer is not high. The mortality from gastro-enterostomy will be 2% or less. The mortality from gastric resection will be 3% to 5%.

The results from surgery are good when the case is well selected and the operation done fits the requirements of the patient. The end results will be good in over 90% of the cases.

49. Lobectomy and Pneumonectomy in Various Inflamatory and Malignant Disorders. Medical Record and Annals.

Lobectomy in the Treatment of Bronchiectasis: Report of a Successful Case

BY
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HOUSTON, TEXAS

Reprinted from *The Medical Record and Annals*, Houston, Texas, August, 1940

Lobectomy in the Treatment of Bronchiectasis: Report of a Successful Case*

John Roberts Phillips, M.D., Houston, Texas

During the past ten years great advances have been made in surgery of the chest. Formerly removal of a lung or portion of the lung was thought to be impossible. With refinements in surgical technique, advance in anesthesia, and increasing knowledge of open pneumothorax, extirpation of a lung or portion of a lung, although it is still a formidable procedure, can be carried out successfully in a high number of cases. There is probably not much justification in preparing a paper on a single successful case of lobectomy for bronchiectasis, except to bring out definite points regarding this type of treatment for a very serious condition. In large medical centers lobectomy is being carried out frequently and with a surprisingly low mortality of about 10%. This compares favorably with radical excisions of other organs such as the rectum, stomach, etc.

The patient whom I wish to present is a white female, age 58. She has had a cough for many years. In 1935 the thyroid was removed for goiter which was supposedly pressing on the trachea; however, following this the cough was not improved. There had been some sputum, but generally speaking the cough was not very productive. In November, 1938, she had an attack of pneumonia. In January, 1939, she had another attack of pneumonia. The location of this disease was not clear to the patient, except she thought the last attack was on the right. She had never had a pulmonary hemorrhage. She easily became short of breath, but had no other cardiac symptoms. Her personal history other than this was irrelevant.

The examination revealed an obese, white female with a blood pressure of 150/100, pulse 98, temperature normal. The head and neck were negative except for a thyroidectomy scar. The vocal cords functioned normally. Examination of her heart and lungs, including an electrocardiogram, was negative. There were rales on the right side of the chest, posteriorly in the base with some dullness over that area. Realizing that the patient probably had a bronchiectasis, she was immediately hospitalized. An x-ray of her chest showed increased density in the base of the right lung which was suggestive of pneumonitis. The left basal peribronchial markings were accentuated. Pleural thickening was present between the upper and middle lobes of the right lung. Lipiodol injected into the trachea revealed a saccular bronchiectasis of the right lower lobe. Routine examination of the blood and urine was negative. Repeated examinations of the sputum for acid fast organisms were negative.

Due to the fact that the patient had recurrent attacks of pneumonia, and had trouble for such a long time, in spite of her age and obesity, it was felt that unless the diseased lobe was removed a fatal attack of pneumonia would result. Consequently on May 29, 1939, the chest was opened widely between the 6th and 7th ribs, and upon exposing the lower lobe it was found to be very firm, atelectatic and rather densely adherent to the diaphragm and posterior chest wall. The adhesions were separated, and the entire righ lower lobe was removed. After a double tourniquet to the stump had been applied, individual blood vessels were then ligated and a Shenstone tourniquet was left to the stump. One penrose drain was left in the posterior gutter together with a mushroom catheter. The chest was closed airtight. There was no blood loss; however, the patient was given 500 cc's of blood during and immediately after the operation. After the operation her pulse was 100 and her condition was very good. After the lobe was removed, when the lung was examined in the laboratory, it was found to contain many bronchiectatic abscesses.

To maintain a negative pressure in the chest I connected a Wangensteen suction apparatus to the catheter. This not only maintained negative pressure, but sucked the cavity dry, allowing no fluid to develop.

The patient had a very easy, uncomplicated course. The x-ray on the tenth day showed the upper lobes to be completely expanded. Her condition continued to improve so that I was in no hurry to remove the tourniquet, although it came loose on the fourteenth day.

On June 21 I took her back to the operating room, and under a light anesthetic enlarged the opening and removed the tourniquet, and to my surprise the residual cavity was very small. There was no bronchopleural fistula. To establish drainage of the cavity I removed a section of the 7th rib. The patient continued to make an uneventful con-

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valescence, and on July 19, less than one month later, the tube was removed from the chest, and all evidence of a bronchial fistula had disappeared. One month later all wounds were completely healed, and the patient was feeling much better. The cough was greatly relieved, and there was no sputum. A lipiodol injection revealed that all bronchiectatic tissue had been removed.

The important points that I wish to emphasize in this case are in regard to diagnosis. A patient who has a prolonged productive cough, even though the physical examination is negative, requires x-ray examination of the chest. If x-ray examination is not conclusive, then a bronchoscopy should be carried out to exclude a foreign body or abscess. Further information will be obtained by study of the bronchial tree after lipiodol injection.

There are many things that can be tried from a medical standpoint which will improve the patient's condition with bronchiectatis, but lobectomy is the only procedure which offers a chance of cure. When lobectomies were first being done, due to the fear of open pneumothorax and the fear that total empyema might result, the procedure was carried out most entirely as a two-stage one. Now, however, due to the improvements in surgical technique, positive pressure anesthesia, I believe that the convalescence can be lessened by carrying out the procedure in one stage. Certainly when the stump can be adequately closed and buried, a one-stage procedure can be safely done, and it is not at all uncommon to have all wounds healed within one month. After extirpation of the lobe for one who has had a suppurative process going on in the lung for a number of years, to obtain relief is not only gratifying to the patient but to the surgeon as well.

DISCUSSION

Dr. W. J. Stork: The importance of a thorough study by x-ray followed by radiopaque media insufflation in all cases suspected of bronchiectasis has been duly and rightfully stressed by Dr. Phillips. Routinely, the patient should be started on small doses of iodides by mouth at least a week or so before the insufflation is attempted. If the patient shows no reaction from the iodides, a preliminary plate of the chest is taken. Immediately after the insufflation of about 20 c.c. of lipiodol, another plate is taken to note the progress made, and if more is needed, we proceed with caution. As much as 50 c.c. has been given without danger. The 40% solution is used for diagnostic purposes, while the 20% solution is used for therapeutic purposes.

The term "bronchiectasis" is used to signify nothing more than bronchial dilatation in which usually the lower lobe, or lobes, are involved. The upper lobe is usually involved in chronic cases of T.B.C. With only a moderate thickening of the bronchial wall and the presence of air in the bronchus, in ordinary cases this is insufficient to the degree of contrast needed for visualization by x-ray. From a consideration of the pathogenesis of bronchiectasis, it will be seen that there is present, in almost all cases at some stage of the disease, an inflammatory reaction in the lungs; this persists usually for a long time, is associated with the formation of large amounts of scar tissue, and with a distortion of the lung structure. In addition, there occurs at the same time, in many of the cases, a partial atelectasis of the lung and is usually recognized on the plain film. Three mechanisms take part in the production of this disease: (1) a partial obstruction of the bronchial tree; (2) a weakening of the bronchial walls; and (3) traction on the bronchial walls. These factors operate in association with one another; only rarely can one of them alone cause the condition.

The obstructive cause may be a foreign body, a stricture, a neoplasm, massive mediastinal glands, or mucoid exudate resulting from inflammation of the bronchi. The weakening of the bronchial walls is the result of infection such as suppurative bronchopneumonia following sinusitis, measles, whooping cough, lung abscesses, chronic pulmonary T.B.C., or influenza. Chronic empyema may be the direct result of long standing bronchiectasis. Since the suppurative pneumonia involves the interstitial tissues and a tendency to chronicity, large granulation tissues are deposited throughout the affected lung. As the granulation tissue atrophies to form scar tissue, it shrinks and draws the lung together, causing traction upon the weakened bronchial wall. Even before this takes place, traction is exerted upon the weakened bronchial walls by the normal negative intrapleural pressure. Usually we find two kinds of dilatations—the cylindrical type and the saccular or club-shaped type.

Lipiodal injected into the normal lung structure at first only reveals the bronchi and their small bronchial branches, but within a few minutes, due to forces of gravity, capillary attraction, and suction from localized atelectasis produced by occlusion of the bronchioles, the material enters the terminal alveolar structure. Here it presents a feathery appearance which is quite characteristic. Once it gets into the alveoli, there is only one means of escape—namely, by phagocytosis and mechanical removal of these cells. As a result it remains detectable in the terminal lung structures for many months. For this reason, the injection should not be repeated too frequently. In bronchiectasis, since there is only chronically infected mucous membrane remaining, no absorption can take place and the individual has no other means of ridding himself of infection other than by cough.

The symptoms of bronchiectasis, besides cough, are usually vague pains in the thoracic cavity, profuse expectoration in the mornings, evening elevation of temperature, and hemorrhage. The latter can be very profuse and massive, especially in the hemoptysic type in which this is often the only symptom. In dry bronchiectasis, symptoms are usually less than in the wet and are often masked.

Postural and bronchoscopic drainage, inhalation of carbon dioxide, and respiratory exercises should be carried out religiously. If these fail, and symptoms persist, lobectomy is advised as this offers the only cure.

In conclusion, I wish to say that the dangers of bronchography have been overestimated, particularly in tuberculosis. It is of particular value in those cases in which surgery is being considered for the obliteration of persistent large cavities. It usually will delineate the limits of the cavity and the bronchiectatic lesion. Often times it rules out a tuberculous cavity and the case can then be treated as a nonspecific bronchiectasis.

Dr. Judson Taylor: I have some x-ray slides here tonight which I thought might be of interest in connection with this paper. This was a man 39 years

old, and for a period of several years he had suffered from a very foul breath and copious expectoration and periodic hemorrhages. The greater part of the bronchiectasis is on the right side, but he also has some on the left. He was a very sick man when he entered the hospital. It was thought that a bronchoscopy might drain his cavities and keep him fairly comfortable and something practical had to be done for him. It was decided to take out the right lower lobe by a Crawford incision. There were considerable adhesions, but it was not difficult to remove them. I adopted the use of a guillotine and we had to resort to this. He lost some blood and had a rather stormy convalescence. In over 45 days he was up and about and at the present time, after five months, he is doing his work and is not having very much sputum. I am sorry that we do not have a picture immediately after the operation showing lipiodol. A bronchoscopic would do the work but it takes some time, and from an economic standpoint, it cannot always be used. With proper preoperative care and with proper postoperative care, the mortality in bronchiectasis should not be very great.

Dr. Ghent Graves: I hesitate somewhat to rise and say anything in this surgical atmosphere. This is an illustration of good surgery. If these cases are diagnosed early and properly, they respond very well to pulmonary drainage and bronchoscopic drainage. Surgery is necessary in the neglected cases. I am not clear in my own mind yet which are non-surgical and which are surgical. Early operations keep down mortality, but I am not certain that this is advisable. With the proper use of the bronchoscope many of these cases can be alleviated. Bronchial abscesses leave no alternative except operation.

Dr. Sidney Israel: I have seen many phases of bronchiectomy; 90% to 95% of bronchiectatic cases are due to sinus diseases. The lower lobe is involved because fluids drain down in the cavity. Some infections are due to irritants, particularly such as smoking. I am uncertain as to the amount due to this. Men should have fewer infections because of the exercise they take. Smoking tends to counteract this advantage. Now that women smoke so generally, I wonder what effect this will have. The views of therapeutics with regard to sinus are going to have to be rewritten. The chronic symptom is the cough. The public is so schooled that we must give them a cough medicine when they cough. A cough is the one way of expelling the mucous matter. The sedative cough medicine is the one mixture which does have the tendency of arresting that cough reflex, so the lung cannot drain, and then we have trouble. The question of diagnosis which you have heard is well analyzed. One point I would like to bring out here in the use of lipiodol—one should be very careful in the use of nasal or oily drops. The ordinary lung will expel 90% of the lipiodol in 24 hours, but I have seen it remain more than a year. When I use lipiodol, I am very careful. There is yet another thing which is very important: that is, which lung is vital and which lung to operate on when a surgical condition develops. I would say that very few cases of bronchiectasis should be operated on, not more than 5%, and the rest of these cases should be treated by someone else.

Dr. Phillips, closing: I find it very easy to administer lipiodol in treating bronchiectasis—pull the tongue forward and let the lipiodol drop in. By changing the position of the patient, you can fill one side and then the other. In regard to postural drainage, the medical man must always be on the outlook for the best method. In some cases special beds have been patented so that the patient can be tilted to obtain the best drainage. In almost every case, a bronchoscopy should be done before operating. It is very important to carry out a very thorough study to know where the involvement is and how much, so that the final result can be estimated.

THE SURGICAL MANAGEMENT OF ACUTE INTESTINAL OBSTRUCTION

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Intestinal obstruction has always commanded the respect of the general practitioner, internist and surgeon. Mortality figures continue to be manifest from 25 to 60 per cent in some of our best institutions and hospitals. It is our purpose to acquaint the reader with a few pertinent advances which have contributed much toward the lowering of mortality, and to present a series of personal cases exemplifying results obtained by the newer concepts of the disease.

All of us are familiar with the symptoms and signs of classical obstruction. There is crampy abdominal pain, vomiting, distention and obstipation. The past history will frequently give one a lead as to the nature of the etiology. The differential diagnosis rests mainly between obstruction and massive peritonitis. In the latter we do not see visible peristalsis and the abdomen is generally tender. Obstruction shows all the phenomena of shock with its characteristic facies, subnormal temperature and leucopenia. This is not the case with peritonitis. Early signs are those of toxemia; late signs are those of dehydration. With the latter we find lowered blood chlorides, rise in blood urea and a rise in the carbon-dioxide combining power with impending alkalosis.

The causes of acute obstruction may be conveniently classified into three main categories, as follows:

I. Mechanical
- Hernia
- Adhesions
- Congenital malformations
- Volvulus
- Intussusception
- Foreign body
- Tumors—neoplastic
- inflammatory
- Ulceration and stricture

II. Adynamic
- Infectious
- Circulatory
- Nervous
- Traumatic

III. Dynamic
- Lead poisoning

Circulatory disturbances are chiefly those of emboli or mesenteric thrombosis. Nervous disorders may cause ileus due to interference of nerve supply, as from diseases or tumors of the spinal cord. Traumatic obstructions include ileus resulting from operative manipulation.

Very few subjects have been enriched with as much clinical and experimental research as has intestinal obstruction. It would seem appropriate to summarize previous work done by a few brief corollaries.

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1. The closer the obstruction to the pancreatic duct, the more acute the symptoms (Draper, Eiseberg, Maury, Sweet).

2. Animals dying from obstruction show a dilated stomach and bowel above the obstruction, capillary dilatation of the mucosa, splanchnic congestion, large amounts of reddish-brown fluid rich in bacteria within the intestine, hyperplasia of the lymph follicles, multiple necrotic areas in the intestinal wall, congestion and cloudy swelling of the liver, kidneys, and pancreas, free fluid in the peritoneal cavity (Draper, Hartwell, Whipple, Rowntree).

3. If there is interference of circulation (strangulation), symptoms are most acute (Brooks, Hartwell, Copher).

4. A toxin has been recovered which is bacterial in origin (Dragstedt, Bunting & Jones, Ellis, Draper, Roger & Garnier) or which is mucosal in origin (Whipple).

5. Closed loop obstruction with establishment of intestinal continuity dies similar to simple obstruction (Whipple, Dragstedt, Murphy & Brooks, Bunting-Jones).

6. An isolated segment of bowel left in the peritoneal cavity soon becomes devoid of bacteria—if then the ends are closed, animals do not die (Dragstedt, Murphy & Brooks).

7. Removal of the pancreas in obstructed animals delays death as much as eight days (Sweet).

8. Blood chlorides are lowered, blood urea rises—and death can be delayed by replacing fluids and electrolytes (Haden & Orr).

9. Intestinal contents recovered from obstructed animals injected intravenously in another animal produces death; injected into normal bowel does not have any effect (Whipple, Sweet, Ellis, Dragstedt).

10. The toxin is absorbed by intestinal lymphatics and may be recovered from the thoracic duct (Murphy & Brooks).

11. The toxin will traverse injured mucosa (Hartwell, Brooks) or peritoneum and inflated bowel (Stone & Firor, Schonbauer).

We are well aware of the many hypotheses which have been propounded in explaining the mechanism of obstruction. To Wangensteen we give credit for the most logical approach to the solution. We no longer believe that histamine or some proteose causes death in these cases. The loss of fluids and electrolytes will be lethal thru dehydration, and yet the absorption of toxins from bacteria and mucosal degeneration will produce death much sooner. Whipple and his associates have shown that the potassium ion is an important constituent of these toxins, inasmuch as their relative loss from cells into obstructed succus entericus and eventual absorption into the blood stream may be the sole cause of death. This was further corroborated by the fact that similar changes even to the point of death occur in cases of adrenal insufficiency and cholera. The exitus in such cases is attributed to the inhibitory effect of potassium ions on cardiac muscle. A high obstruction with its short loop over-distended with gaseous and liquid waste becomes a veritable closed loop obstruction due to the proximity of the pyloric and cardia musculature. It is quite evident that bacterial toxins and potassium ions are not absorbed thru any but damaged bowel wall. This damage occurs first at the point of obstruction and soon is extended to the distended intestinal wall. It has been shown that the mesenteric veins absorb little or no toxin but do absorb potassium from the intestinal fluids. The lymphatics, on the other hand, absorb the toxin, and a considerable amount traverses the permeable bowel wall transperitoneally. If the process continues we get vascular occlusion to the segment involved with strangulation. The proximity of the pancreatic secretion in higher obstruction

hastens absorption due to the deleterious effect of the autolytic ferment. What we want to emphasize is, the shorter the loop or the higher the obstruction, the more pressure the loop must bear, and consequently the more rapid the toxemia and hyperpotassemia. Lower obstruction permits the patient to last sufficiently long for the advent of reversed peristalsis, chloride and water loss, and a somewhat slower death from dehydration.

These, then, are the facts of consequence in obstruction. We must either reduce intraluminal pressure or release the obstruction before irreparable bowel damage takes place. Wagensteen proposed decompression of the upper bowel by his epoch-making suction siphonage, and in doing so, he was able to save the lives of scores of otherwise hopeless cases. It is one of the simplest methods we have of decompressing the bowel. An ordinary Levine tube is inserted thru the nostril into the stomach; and after lavaging this viscus until the return fluid is clear, the tube is advanced into the duodenum. This manoeuvre should be checked with a roentgenogram, for if the tube does not pass the pylorus, decompression will be

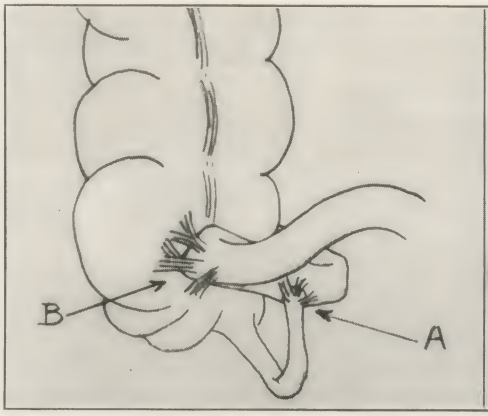

Fig. 1

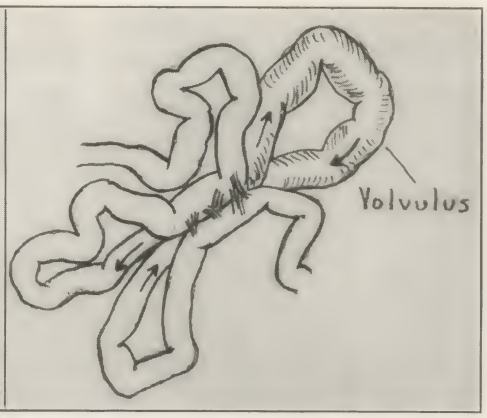

Fig. 2

Fig. 1.—Case—Mrs. T. G. Ileum obstructed (A) 1st perforation—appendix to ileum. (B) 2nd perforation—cecum to ileum.

Fig. 2.—Volvulus thru two loops of adherent bowel.

ineffective. Constant suction is applied to the end of the tube by a siphon bottle system; this removes accumulative liquid and gaseous material from the upper bowel, obviates vomiting, prevents distention and intestinal wall damage therefrom, and permits administration in some cases of small amounts of fluid by mouth since the excess is always removed thru the tube. The patient's condition is much improved as is evidenced by the clinical chart and blood chemistry studies. It is not a substitute for surgery but allows the surgeon to prepare his patient more adequately for the operating room.

Soon after Wangensteen's enlightening contribution came the work of Abbott, Miller and Johnston who adapted the method for decompression of the lower bowel. They devised a double-lumen tube which had a small inflatable balloon on the presenting end. After the tube had passed the pylorus, the baloon was inflated and peristalsis carried the end of the tube rapidly to the point of obstruction. The advantages of this tube were numerous; decompression was virtually 100 per cent effective, and if the clinician desired further information regarding the nature of the obstruction, he had merely to introduce a little barium thru the

RESULTS OF CASES

Case No.	Age	Sex	Race	Type lesion	Location	Decompression	Surgical Procedure	Result
1.	2	F	C	Intussusception	Ileum thru splenic flexure	Yes	Reduction Fixation	Cured
2.	24	M	W	Perforated appendix c abscess	Terminal ileum	Yes	Enterostomy	Cured
3.	26	F	W	P.O. Adhesions	Terminal ileum	Yes	Adhesions freed	Cured
4.	28	F	C	Pelvic abscess	Terminal ileum	Yes	Enterostomy	Well from obstruction. Died 6 wks. of sepsis
5.	28	F	W	Adhesions Mesenteric tumor	Ileum Transverse & Ascend. colon	Yes	Adhesions freed. Tumor excised	Cured
6.	29	F	W	P.O. Adhesion	Sigmoid	Yes	Adhesion freed	Cured
7.	29	F	W	P.O. Adhesion	Ileum multiple	Yes	Adhesions freed	Cured
8.	29	F	C	P.O. Adhesion Large ovarian cyst	Ileum	Yes	Adhesions freed Cyst excised	Cured
9.	30	F	C	Volvulus thru adhesion	Ileum	Yes	Adhesion freed Enterostomy	Cured
10.	30	F	C	Regional ileitis	Terminal ileum	Yes	Ileocolostomy	Cured
11.	30	F	W	T.B. Peritonitis Adhesions	Multiple ileum & Sigmoid	Yes	Cecostomy	Cured
12.	30	F	W	P.O. Adhesion	Ileum	Yes	Adhesion freed	Cured
13.	34	F	W	Bilateral tubo-ovarian abscess	Ileum	Yes	Drainage	Cured
14.	34	M	W	Lymphosarcoma mesenteric glands	Ileum	Yes	Biopsy	Well of obstruction Died 6 months
15.	34	F	C	Volvulus	Sigmoid	Yes	Transverse colostomy	Died 2 days Acute 12 days
16.	36	F	W	Adhesions—salpingitis	Ileum	No	Adhesions freed	Cured
17.	36	F	W	Adhesions—salpingitis	Sigmoid	Yes	Adhesions freed	Cured
18.	36	M	W	Incarcerated R. Ing. hernia	Ileum	No	Bowel released Herniorrhaphy	Cured
19.	36	F	W	Hernia thru adhesive band	Ileum	Yes	Adhesion freed	Cured

TABLE (cont'd)

Case No.	Age	Sex	Race	Type lesion	Location	Decompression	Surgical Procedure	Result
20.	38	F	W	Carcinoma	Sigmoid	Yes	Colostomy	Recovery. Died of Ca. 3 months
21.	43	F	W	Adhesions cholecystitis	Ileum & Asc. colon	No	Adhesion freed Cholecystectomy	Well
				Adhesion, P.O.	Ileum	Yes	Enterostomy	Died 10 days peritonitis
22.	45	F	W	P.O. Adhesions 10 days—acute	Ileum	Yes	Enterostomy	Died
23.	45	M	W	Volvulus thru adhesion	Ileum	Yes	Adhesion freed	Cured
24.	46	M	W	Recurring Ca. cecum- previous resection	Ileum	Yes	Enterostomy	Well from obstruction Died 6 weeks
25.	46	M	W	Diverticulitis c obstruction	Sigmoid	Yes	Colostomy	Cured. Resection 8 weeks later
26.	50	F	W	Adhesion appendicitis Peritonitis	Ileum	Yes	Enterostomy	Cured
27.	52	F	W	P.O. Adhesion	Ileum	Yes	Enterostomy Adhesion freed	Cured
28.	55	M	W	Carcinoma	Sigmoid	Yes	Rankin colostomy	Recovery Died 8 mo. from Ca.
29.	57	M	W	Incarcerated R. Ing. Hernia	Ileum	No	Obstruction released Herniorrhaphy	Cured
30.	60	M	W	Appendiceal abscess	Ileum	Yes	Ileocolostomy	Cured
31.	66	F	W	Carcinoma cecum	Ileocecal	Yes	Oleocolostomy R. Colectomy	Cured
32.	66	F	W	Carcinoma	Splenic flexure	Yes	Cecostomy	Recovery Died 1 mo. after resection
33.	67	F	W	Carcinoma	Sigmoid	Yes	Colostomy	Recovery Died 1 yr. of Ca.
34.	69	F	W	Adhesions cholecystitis	Hepatic flexure	Yes	Adhesions freed Cholecystectomy	Recovery of obstruction Died 10 days cirrhosis
35.	74	M	W	Diverticulitis Carcinoma	Sigmoid	Yes	Rankin colostomy	Cured

* All the above cases were acute obstructions, whether recognized before operation or not.

tube which could be re-aspirated after the roentgenogram was taken. Patients have been kept alive for days with this ingenious method, enabling improvement in both clinical diagnosis and their apparent operative condition. Decompression by such a route, accomplishes a delay of death by obviating toxemia. It remains for administration of fluids and chlorides to combat the other cause, e.g. dehydration and hyperpotassemia.

The chapter on water balance has recently been another great contribution in the management of these cases. The normal individual in 24 hours loses 1,000 to 1,500 c.c. of fluid thru the kidneys, 200 to 400 c.c. thru the stool, and 1,000 to 1,500 c.c. insensibly thru the skin and lungs. Coller and Maddock found that their surgical patients lost even more insensibly; this varied from 1,500 to 2,400 c.c. Add to this the amount lost through operative hemorrhage, sweating on the operating table, and fluid lost in vomiting and we find that few patients are ever in a state of positive water balance (Bingham). Again, each degree of fever requires about 300 c.c. more of fluid intake. From these figures we advocate that our patients receive about 3 to 4 litres of normal saline intravenously the first 24 hours, and about 1½ to 2½ litres daily subsequently. Coller and Dick found that excessive chloride intake may cause a tissue retention of fluids, so we usually give sterile water or 5 per cent glucose in the succeeding days. A safe rule to adopt is to give sufficient fluids to enable a urine output of 1,000 to 1,500 c.c. daily.

The duration of symptoms, studies on blood chemistry, site and nature of the obstruction and clinical condition of the patient give one an index of risk in any particular case. Whipple calculated this index from the admission temperature, pulse and respiratory rates. We refer the reader to his article. Just how long an interval is permissible while delaying operation rests with the judgement of the surgeon. Impending necrosis of a loop of intestine in strangulated cases will not tolerate delay without a high mortality. There will be occasions on the other hand when the surgeon feels that the condition of the patient will not permit immediate operation in strangulation. This should be the exception rather than the rule. In the simple obstructions decompression is worth its reward and since it can be accomplished fairly quickly, the risk of laparotomy can be lowered. Again, there are times when the diagnosis between obstruction and ileus from peritonitis becomes difficult. We can only discourage such exploratory laparotomies in spite of the immense curiosity that may confront the operator. As we have postulated many times, a poor risk on admission may be converted to a reasonably good risk by certain pre-operative measures. Nevertheless, there remains that category of patients which continue as poor risks and the surgeon should be content with release of the obstruction by the simplest means at his disposal; this may be enterostomy. John B. Deaver once said, "it is better to look forward to two operations and a live patient than one operation and a dead patient". We heartily agree; to do more than enterostomy in some cases may prove distasteful to good surgical judgement. The management of the obstructing lesion itself is a separate chapter. Generally speaking, resection carries a high mortality, and if necessary, should be done after exteriorizing the efferent and afferent loops. On the other hand, division of a few simple adhesions may afford less trauma to the intestine than a simple enterostomy. The judgement lies with the dexterity and alacrity of the operating surgeon.

Intussusception brings special considerations to mind. There are still a few who believe expectant treatment less lethal than operative treatment in infants under 18 months. These young patients do just as well or perhaps better than elderly individuals with laparotomy. If the surgeon is able to reduce the intussusception manually, the movable segement should be anchored then to the parietal

peritoneum to prevent recurrence. If, however, one is unable to reduce the intussuscepting part, we caution against resection, as the resulting mortality will be prohibitive. A preferable method is one of exteriorizing the pathological loop, and it can soon be converted into a double lumen enterostomy. This obviates the absorption of necrotic products of intestinal wall of questionable viability. Moreover, it would be rather poor judgement to perform enterostomy and leave an unreduced segment of bowel with its strangulation within the peritoneal cavity. Intussusception in cases of intraluminal tumor not only present problems of treatment for obstruction but of removing the tumor itself. Such surgery is best relegated to two or more stages depending upon the condition of the patient.

Regardless of the pathology, the theme we should like to emphasize is this: when the condition of the patient is poor, be content with enterostomy, unless one is leaving a strangulated loop of intestine within the peritoneal cavity. In the latter case, it is better to exteriorize the segement and to convert it to a double-barreled enterostomy. Further reparative surgery can be undertaken more safely at a later date. On the other hand, when the condition of the patient appears satisfactory, and the lesion is not of great magnitude, it may prove better judgement to attack the lesion itself particularly if decompression has been afforded the patient.

One interesting case came to our attention not long ago which we think unusual from a standpoint of etiology. The appendix itself had caused the obstruction. One similar case has been reported by K. M. Lewis in February 1938.

"A white female, aged 50, entered the hospital December 28, 1938 with a three-day history of pain, obstipation and 'fecal' vomiting. Her appendix had supposedly been removed three years previously. After a rapid decompression of two hours, the abdomen was opened and a generalized peritonitis found. The lowermost distended loop of ileum was elected for a Witzel enterostomy and drainage was placed to the abdominal cavity. No exploration was done for fear of traumatizing the inflamed bowel. The patient responded nicely and after a series of roentgenograms were taken four weeks later, she was again explored for an indeterminate mass in the cecum. The pathological process is diagrammed in figure 1. All evidence of previous inflammation had subsided and there were two perforations, one of the appendiceal tip and one in the cecum, both walled-off by the same loop of terminal ileum. This produced the obstruction by angulation. The appendix and tip of the cecum were resected and the enterostomy left undisturbed. Convalescence was uneventful except for a minor wound infection and she left the hospital the 15th post-operative day. Normal stools were being expelled per rectum and the enterostomy was practically closed on discharge."

In the series of thirty-five cases presented herein, there was a direct mortality of 11.4 per cent from obstruction. The age group varied from 2 to 74 years of age. There were 10 males and 25 females; 29 were white and 6 colored. One case had two episodes of obstruction. The causes of obstruction were in the main mechanical as follows: hernia, 3; volvulus, 3; intussusception, 1; adhesions, 14; neoplastic tumor, 8; and inflammatory tumor, 4. There were 3 cases of adynamic ileus, all from reflex peritonitis. Decompression was used routinely where obstruction was suspected before laparotomy. Various surgical procedures were utilized, as follows: enterostomy alone, 14 cases; freeing adhesions alone, 8 cases; enterostomy with freeing adhesions, 2 cases; resection of the pathological process with or without enterostomy, 9 cases; and other procedures, 3 cases. There was a delayed mortality of 28.6 per cent in connection with the pathology present. There were two cases of volvulus thru an adhesion between two apposed loops of bowel which we thought rather unusual and are diagrammed in figure 2.

Conclusions:—1. In the management of intestinal obstruction, decompression is the keynote of success, particularly if performed before irreparable intestinal damage has occurred.

2. Replacement of fluids is necessary to combat dehydration. The amount given should be sufficient to enable the kidneys to eliminate 1,000 to 1,500 c.c. daily. Whole blood should be given as an adjunct when there is blood loss.

3. Release of the obstruction surgically by the least manipulative method is paramount, particularly when the risk of the patient is questionable.

4. Correction of the pathological process causing the obstruction should be relegated to a later stage when the patient's condition justifies additional surgical treatment.

5. A series of 35 patients, exemplifying 36 obstructions is presented wherein these maxims have been adopted; the mortality from the intestinal obstruction was 11.4 per cent, and the delayed mortality from the pathological process present was 28.6 per cent.

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Recent Advances in the Surgical Management of Cavernous Pulmonary Tuberculosis*

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In the management of any pulmonary lesion two factors, rest and fibrosis, are paramount in attaining healing. Due to the granulomatous nature of tuberculous tissue the interval in such a disease must necessarily be longer to obtain such resolution. Any method which would accelerate fibrosis could materially shorten the period of disability for the patient. The answer to such a problem is artificial collapse. We are all aware of some of the twenty methods of producing collapse to a lung, and most of us agree that where it is indicated, artificial pneumothorax should have first call. Of all the "cures" in pulmonary tuberculosis, only 15% get well alone; that is, with recumbency. The rest demand some form of collapse, and a large per cent of these must be permanent. Roughly speaking, when the lesion in one lung represents 20% of the pulmonary tissue normally present, a permanent collapse is needed for a permanent "cure."

Since Spengler first devised thoracoplasty in 1889 for the treatment of pulmonary tuberculosis, many changes have been made from the operation we first knew. Many of us are aware of the work of Sauerbruch in popularizing rib resection. His technic was one of posterior resection of short segments of all ribs from numbers one to eleven. Max Wilms soon modified this operation with the innovation of the term "selective collapse" wherein he removed only a sufficient number of ribs to close off the lesion. This was usually a seven or eight rib operation in one or two stages which followed within a week interval. The shortcomings of removal of short rib lengths in closing large cavities was soon realized by both Brauer and Friedrich working independently, and they proposed greater resections to control such lesions. Needless to say the mortality of such a procedure was necessarily high, and successful survivals were dramatic rarities, hence, few exponents of thoracoplasty were found until the present generation of such men as Alexander, Archibald, Nissel, Bull, Nystrom, Matson, Lilienthal and others. The modern thoracoplasty calls for removal of total lengths of at least the first and second ribs from a posterior approach, and sufficient lengths of successive ribs to insure absolute collapse of the lesion. This is divided into multiple stages dependent on the patient's ability to respond at the moment. Rib beds are formalinized to delay rib regeneration, and an additional anterior stage may be necessary to effect sufficient collapse in some cases. No small part in results obtained today are due to developments in anesthesia, together with careful pre- and post-operative care. With such management, the mortality should not exceed 5% to 10%.

In spite of orthodox methods of handling cavity cases, one is confronted occasionally with the stiff-walled cavity which defies closure. This may be due in part to a slight mediastinal shirt or to a valve-like obstruction to the bronchus which feeds such a cavity. While the removal of transverse processes and secondary thoracoplasties have materially affected some of these cases, those who do considerable thoracic surgery still see the occasional case which resists acceptable methods of treatments. Semb proposed his apicolysis of removing all extrafascial attachments of the first and second ribs, allowing the cavity to drop two or three interspaces; then the area was sutured over by transplanting the posterior ends of the intercostal bundles in a hammock-like fashion to hold the cavity down. This has been effective in a few cases. Neuhof has proposed an operation called pneumocavernolysis in which he strips all regeneated rib and fascia from the cavity area and sutures a large iodoform pack in place as a collapsing medium. The pack is removed some six weeks later. Needless to say, the operation is considered quite formidable by some, as a careless entry into the cavity will result in death oftener than not. In a recent communication from Matson, this procedure was used with some modification in five patients without a death, leaving a drainage tube down to the pack until its removal was effected. About a year ago we operated such a case, and through a rather fortunate mistake in technic a new approach to the problem was met with apparent success. We have since presented the technic as a novel and potentially valuable method of attacking such resistant cavities.

Miss A. L., white, aged 24, had symptoms of repeated hemoptysis from an exceptionally large pulmonary cavity in the right upper lobe since 1931. Had been a hospital patient for seven years without any reduction in the size of the cavity. Needless to say, the sputum was abundant and was frequently

*Read before the Harris County Medical Society.

blood tinged. She was subjected to three stages of rib resection, including an anterior stage, from September, 1935, to May, 1936. The collapse was effective to the point of leaving a slit-like cavern next to the vertebral bodies which still exuded positive sputum. In January, 1937, a secondary thoracoplasty was performed, removing practically all regenerated ribs over the area of the cavity. An ambitious assistant raised the scapula too briskly and unroofed the cavity. This technical error paved the way for an impromptu method of closure. The cavity was quickly resutured, and in an effort to insure the suture line, the walls were folded again, as one would do in invaginating a tube in a Witzel enterostomy. Pleura was sutured to pleura in a vertical axis, and the cavity was literally scrolled upon itself. The wound was closed in the usual manner and no infection resulted. The result of the operation was gratifying in that sputum became nil almost overnight. Roentgenograms a year later showed the cavity to be closed, and the patient has since married, doing ordinary household duties.

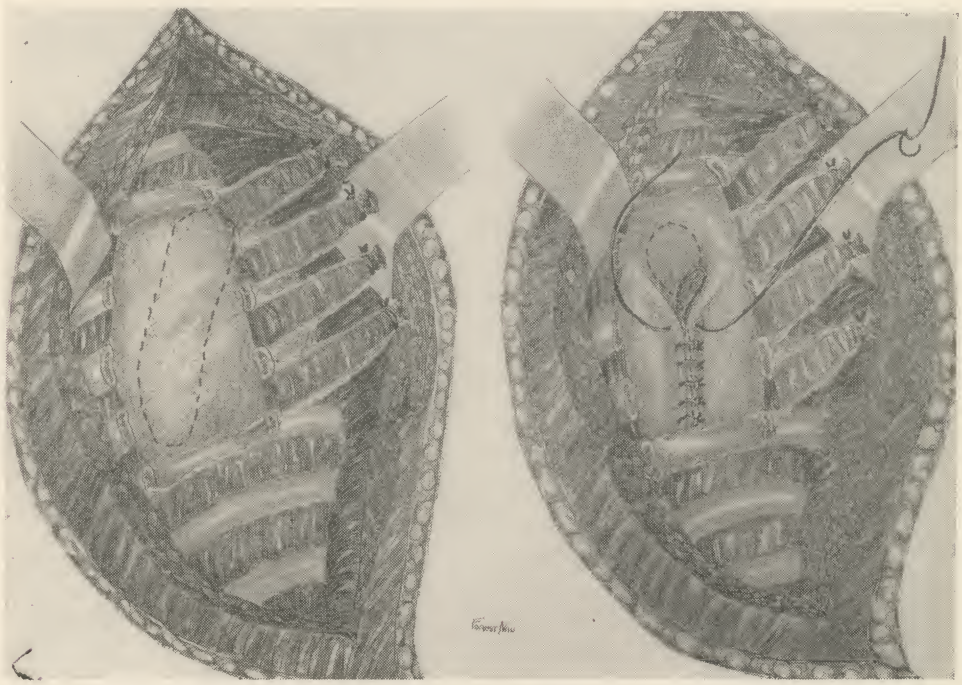

Fig. 1. First procedure in surgical cavity plication. After intercostal bundles are elevated and regenerated ribs resected, parietal pleura around cavity freed and plication begun.

In 1893 Tuffier conceived an operation where air could be introduced extrapleurally in a case of severe hemoptysis, and this patient recovered. The operation was apparently forgotten until Baer in 1913 introduced his procedure of packing with wax. Many materials have since been proposed by various workers as substitutes, namely, paraffin, oil, fat, muscle and even inflatable rubber bags. But few of these have survived their practical application. We still employ paraffin and are now using air or oil in addition. In 1935, Graf, of Dresden, and Schmidt, of Heidelberg, revived Tuffier's operation of extrapleural pneumothorax. The operation is performed either from a posterior or anterior approach, removing a small section of one rib and effecting an endothoracic separation of parietal pleura from chest wall. One must be careful to maintain this fascial plane to avoid hemorrhage or tearing into the lung. The operation is done under direct vision at all times and may be as extensive as desired. Most cases require separation from the 3rd rib anteriorly to the 7th rib posteriorly, but Graf has performed a total endothoracic separation of the lung without much difficulty. The space thus created is filled with saline and an air-tight closure of the wound made in layers. The saline is aspirated on the following day and air replacements begun. One must check the collapse repeatedly with Roentgenograms as the space may become obliterated in a short time. Aften ten days, if one wishes, oil may be substituted for the air and the collapse is converted to a permanent oleothorax. We believe that although oil is absorbed over a period of time, that the procedure thus performed remains as a permanent one, due to the many connective tissue strands and trabeculae which fill in the space. Fibrosis of the pulmonary lesion also helps to maintain the collapse. The complications are obvious. Infection heads the list and may be easily fatal. Hemorrhage, mediastinal emphysema, rupture of the cavity and contralateral spontaneous pneumothorax have all occurred. Subcutaneous emphysema

is always present for a few days but gradually subsides.

The advantages of such a procedure over thoracoplasty are obvious: (1) patients delight in that it is a one-stage maneuvre which they tolerate oft-times better than rib resection, (2) it is selective, as it collapses only the diseased tissue, hence it may be employed more safely on bilateral cases, (3) the mortality has been low in competent hands, varying from 3% to 7%. It is not designed, however, to replace thoracoplasty as it has no place in large cavity cases. Its greatest usefulness is in the small cavity or honeycombed lesion which resists less radical methods of attack.

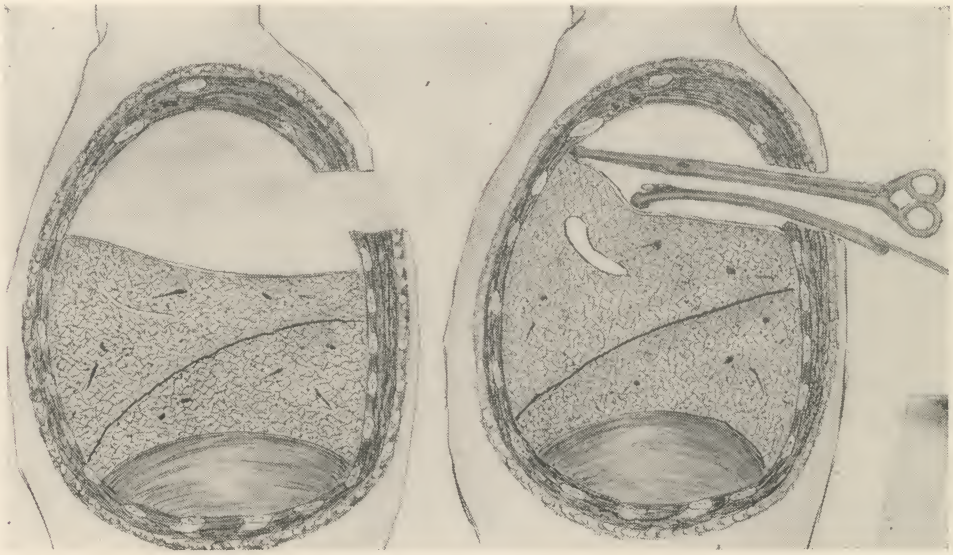

Fig. 2. Steps in extrapleural pneumothorax technic

We are presenting a case of upper lobe extrapleural oleothorax here, for, although the extrapleural pneumothorax has been used in approximately 100 cases in this country, there are very few cases of extrapleural oil.

Mrs. J. B., white, aged 27, has had bilateral tuberculosis with a honeycomb lesion in the upper left lobe. Her symptoms had been present since 1929, and through three years of hospitalization which included a left pneumothorax and permanent phrenicectomy, her result was one of arrest. Unfortunately the pneumothorax was allowed to re-expand prematurely and the lesion in the upper left lobe reappeared. In June, 1938, she was subjected to a left upper lobe extrapleural pneumothorax, resecting a portion of the 3rd rib posteriorly, and effecting an endothoracic separation of the parietal pleura from the apex to the 3rd rib anteriorly, and the 7th rib posteriorly. Aside from moderate venous bleeding, the separation was easily accomplished. The cavity thus created was filled with 350 c.c. of saline and the wound closed in an air-tight fashion. Refills of air were begun within 24 hours and the patient was out of bed by the tenth post-operative day. Sterile olive oil was substituted for the air beginning about the third week and completing the filling by the seventh week. Roentgenograms show an efficient collapse and the sputum became negative.

We do not believe the operation is limited to lesions of the upper lobe. Consequently we adapted it in a case of a basal cavity with hemorrhage with success, and in this regard we believe it is the first time it has been used from the diaphragmatic approach. Thoracoplasty in cases of basal cavity are necessarily the most extensive that we know, and in doing rib resection under such circumstances, much normal lung must be sacrificed to attain cavity closure. In the following case, the upper lobe was left to function normally.

A white male, J. S., aged 24, had a severe hemoptysis as his first symptom in 1935. No medical care was advised and he continued to work for two years with repetition of the same symptom in May, 1937. There was a large cavity in the base of the right lung which resisted attempts at pneumothorax. A temporary right phrenic interruption was performed in June, 1937, to control the hemorrhage, and the cavity diminished to about half its original size. He preferred conservative treatment, but returned in twelve months with a gain of 60 pounds in weight but with frequent hemoptysis. Since thoracoplasty for a basal cavity is necessarily extensive, we conceived of accomplishing closure by the extrapleural route. In October, 1938, a curved incision was made paravertebrally from the 6th to the 10th ribs. The parietal pleura was reflected from the diaphragm after section of a short segment of the 8th rib. Several dense extrapleural attachments in the cardiohepatic angle were ligated before severance, and the lung was elected to the 5th rib posteriorly and the 3rd rib anteriorly. The cavity was filled with 1050 c.c. of saline and an air-tight closure effected. Air and oil replacements were completed by the fourth post-operative week with sputum and hemoptysis absent. Roentgenograms show the desirable result of cavity closure, leaving him a fairly normal upper lobe.

While the technical aspects of the extra-

pleural operation are more difficult, it offers a new field of collapse. We have conceived of using it in hemorrhage cases where artificial pneumothorax is ineffective, or phrenic crush seems ill advised. Eloesser recently reported his experiences in pulmonary hilus ligation for severe hemoptysis, but with a rather high operative and patient mortality. It occurs to us the desired collapse is against the hilum, whether oil or air is used.

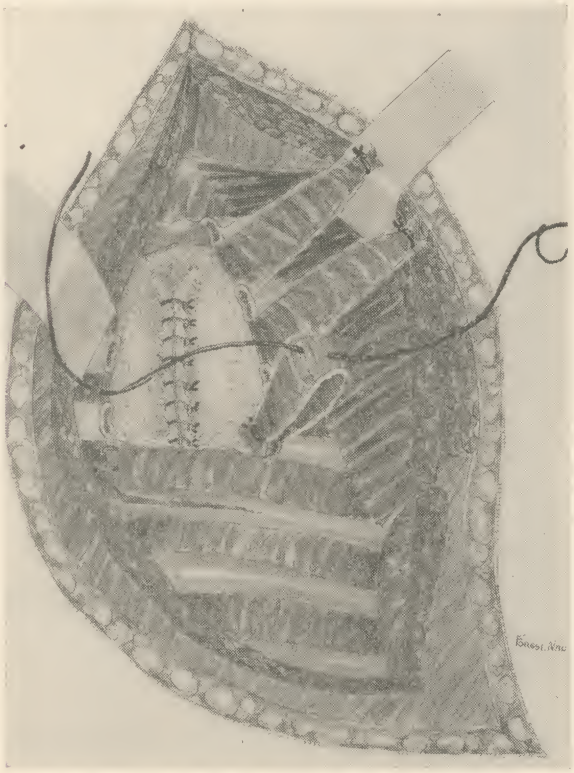

Fig. 3. Showing plication completed—two rows. Intercostal bundles are scrolled over suture line to reinforce.

CONCLUSIONS

1. A new method of cavity closure is proposed for cases resisting the usual thoracoplastic methods.
2. Two cases of extrapleural oleothorax are reported, one of which was performed from a diaphragmatic level for a basal cavity.
3. Extrapleural pneumothorax or oleothorax is suggested for cases of uncontrollable hemoptysis where other surgical methods of attack are futile.
4. Extrapleural oleothorax is a permanent procedure which can be performed with low surgical risk on any but large cavity cases.

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SELECTIVE THORACOPLASTY

RESULTS OF A SERIES OF THIRTY CASES

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SELECTIVE THORACOPLASTY

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IN the surgical management of pulmonary tuberculosis, many advances have been recently made. The reports of thoracic surgeons have improved the outlook to such an extent that we may now safely promise approximately 85 per cent cures. Of all the patients that the phthisiologist sees, only 15 per cent become and remain well after sanatorium regimen alone. In the remaining 70 per cent, collapse therapy must be instituted. Artificial pneumothorax, while not always our first choice, must be accepted as being the most universally applicable. Unfortunately, due to unsurmountable adhesions, one is not always able to induce a collapse by this method. Surgical collapse then becomes necessary for the desired cure.

While the indications for surgery in pulmonary tuberculosis have been somewhat limited in years past, there come to our attention more and more instances where some sort of permanent collapse is advisable. Each thoracic surgeon in the field has his own requisites for operation, but we should like to classify these indications in what seems to us a practical and simple manner:

1. Persistence of symptoms which are distressing to the patient; i.e., severe cough, productive sputum, chills, fever, hemoptysis.
2. Persistence of positive sputum.
3. Persistence of *x*-ray evidence of cavitation or honeycombing.

As we see more patients with old smouldering lesions, we have been more and more suspicious that honeycombing is the underlying pathology. While it is not always possible to demonstrate this with ordinary films, we feel that one is more apt to have success with Oechsli's method of taking a hard film with the Potter-Bucky diaphragm. In no instance do we advise surgery for exudative tuberculosis; such a lesion, if not improved with sanatorium care and recumbency, will only glorify mortality statistics. Needless to say, any degree of cavitation must be closed to prevent spread of the disease to other parts of the lung; persistently positive sputum and hemoptysis can frequently be traced to cavitation.

We have no special prerequisites for surgical risk other than our aforementioned maxims. The patient must be as reasonable a risk for thoracic surgery as for any other major surgical procedure. In diabetics, acidosis must be combated; in cardiacs, decompensation corrected; in syphilitics, serology controlled. In fact, anything is done to improve the general operative risk.

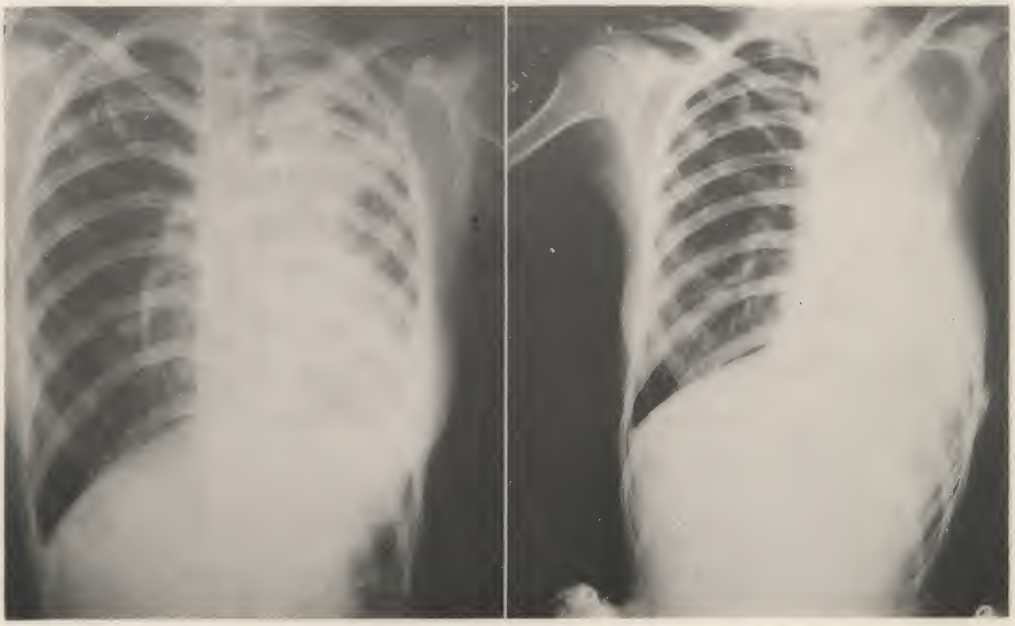
Technique, we believe, has been well standardized and needs little comment. Rib beds are routinely formalinized to obviate threatened rib regeneration should a long interval be deemed necessary between stages. No more than three or four ribs are resected at one stage as a rule, the number depending upon the condition of the patient at the operating table. Any evidence of paradoxical respiration terminates the operation. The first rib is removed in toto, and the lengths of succeeding ribs removed is determined by the underlying pathology. In all cases, the resection begins posteriorly with the costovertebral articulation. The last rib or two is resected shorter to afford a better cosmetic appearance to the thoracic cage. In addition, we believe that this helps to prevent impingement of the scapula behind the last resected rib.

A B

Fig. 1. Case I. A, large basal cavity remaining after temporary phrenic interruption. B, after eleven-rib graded collapse.

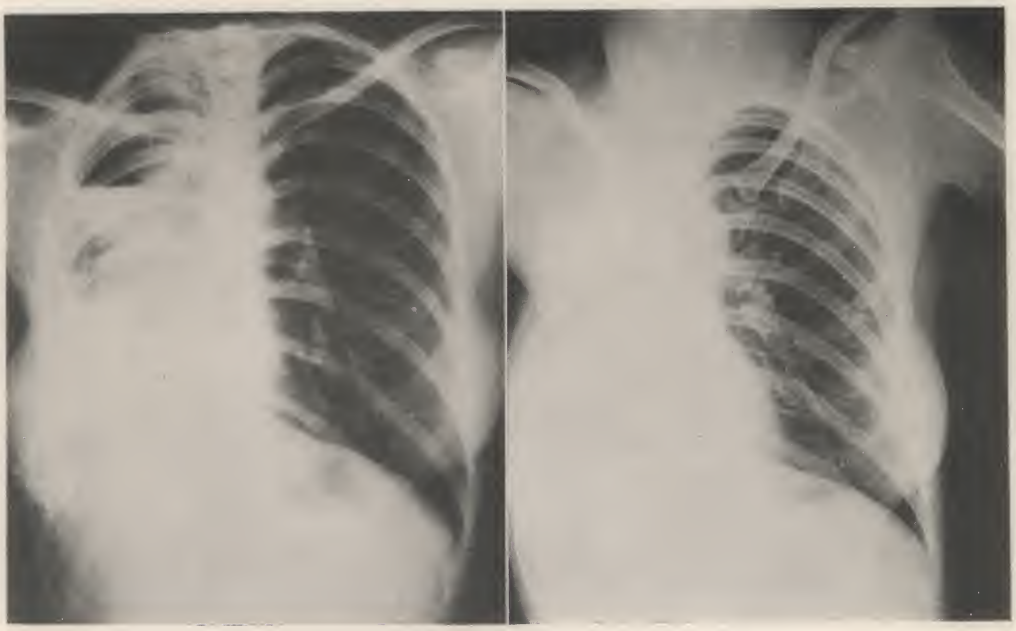
A B

Fig. 2. Case II. A, extensive tuberculosis of right lung and moderate contralateral involvement. B, showing what a phrenic interruption plus one stage of a five-rib collapse will accomplish. Note clearing of opposite lung.



A B

FIG. 3. Case III. A, re-expanded pneumothorax, leaving cavity in upper left lobe. B, after a seven-rib graded collapse.



A B

FIG. 4. Case IV. A, 12 cm. cavity in right upper lobe. B, after four stages of a graded eight-rib collapse.

No	Case	Sex	Race	Age	Side	Stages	Stage Interval	No. Rlbs	Prelim. Treatment	Duration of Symptoms	Surgical Indication	Remarks
1	H.W.F.	F	W	61	L	1	.....	4	Pneumo.* 3 mo.	6 yrs.	Pos. sputum. X-ray—apical cavity	Markedly improved since 2-4-37. Further surgery refused. Neg. sputum
2	R.J.	M	W	20	L	2	30 days	5	Phren.† 6 wks.	3 yrs.	Pos. sputum. X-ray—apical cavity	Well since 5-20-37. Neg. sputum and x-rays
3	L.M.	M	W	60	R	1	.....	3	San'm‡ 6 yrs.	6 yrs.	Pos. sputum. X-ray—extensive involv. whole rt. with cavity	Incomplete and untraced. Did not return
4	C.E.	M	W	29	L	3	24 days 192 days	9	San'm 6 yrs.	7 yrs.	Pos. sputum. X-ray—cavity left upper. Hemoptysis-25 x	Improved since 1-18-38. Sputum neg. Ant. stage necessary for remaining 1½ oz. daily sputum
5	B.J.	M	W	28	R	2	30 days	7	San'm 4 yrs.	4 yrs.	Pos. sputum. X-ray—bilateral involv. with cavity rt. upper	Improved since 6-15-37. No sputum. Opposite lung healing
6	S.M.	F	W	23	R	2	90 days	6	Rest 1½ yr.	1½ yr.	Pos. sputum. X-ray—cavity rt. upper	Well since 2-18-38. Neg. sputum
7	F.M.	M	W	25	L	2	60 days	7	San'm 3 yrs.	3 yrs.	Pos. sputum. X-ray—cavity left upper	Improved since 1-10-38. Sputum pos. but reduced. Needs further collapse
8	Y.H.	M	W	34	R	2	90 days	7	San'm 5 yrs.	5 yrs.	Pos. sputum. X-ray—cavity rt. upper	Improved since 1-5-38. Dyspnea after second stage. Pos. sputum—needs further collapse
9	J.Y.	F	W	34	L	2	30 days	6 scap.	San'm 4 yrs.	4 yrs.	Pos. sputum. X-ray—cavity left upper	Improved since 3-9-38. Sputum decreased
10	E.B.	M	W	39	R	1	.....	3	San'm 4 yrs.	4 yrs.	Pos. sputum. X-ray—cavity rt. upper	Improved since 3-9-38. X-ray and sputum improvement but both positive. Contralateral temporary flare-up. Refuses further surgery
11	C.G.H.	M	W	23	R	3	596 days 21 days	7	San'm 3½ yrs. Phren. 1 yr.	3¾ yrs.	Pos. sputum. X-ray—multiple cavities upper rt	Well since 2-27-38. Severe diabetes. Prev. history septic bilateral parotitis, rt. TB empyema. No surgical complication
12	R.J.K.	M	W	34	R	1	.....	3	San'm 2 mo.	4 yrs.	X-ray—honeycomb lesion rt. apex	Well since 12-10-36. Never had sputum
13	E.J.G.	M	W	36	L	1	.....	5	San'm 5½ yrs. Phren. 3 yrs.	6 yrs.	Pos. sputum. X-ray—cavity and honeycomb left apex	Well since 8-6-35. Extensive one-stage operation. High diaphragm from phrenic op.
14	E.P.	M	W	24	R	1	.....	3	San'm 8 mo. Pneum. 8 mo.	8 mo.	Pos. sputum, hemoptysis. X-ray—cavity rt. upper	Improved since 12-4-36. Refused further surgery. Working. No further hemoptysis. Sputum pos.
15	C.C.L.	M	W	26	R	4	43 days 665 days 90 days	7	San'm 1½ yrs.	4 yrs.	Pos. sputum, hemoptysis. X-ray—7 cm cavity rt. apex	Well since 1-31-38 Had refused further surgery after first stage until hemoptysis. Anterior stage done

No.	Case	Sex	Race	Age	Side	Stages	Stage Interval	No. Ribs	Prelim. Treatment	Duration of Symptoms	Surgical Indication	Remarks
16	G.H.	M	W	30	L	2	32 days	4	San'm 1½ yrs. Pneum. 16 mo.	2 yrs.	Pos. sputum. X-ray cavity left upper, honeycomb both uppers	Well since 11-30-37. Working. Opposite lung cleared
17	W.T.	M	C	30	L	1	.....	5	San'm 5 yrs. Phren. 3 mo.	6 yrs.	Pos. sputum, hemoptysis. X-ray—cavity and honeycomb upper left	Well since 1-21-36. Streaked sputum for 178 days postoperative. Now asymptomatic and working
18	O.S.	M	C	20	L	2	64 days	5	San'm 8 mo. Phren. 3 mo.	15 mo.	Pos. sputum, chills, fever. X-ray—cavity and honeycomb whole left	Improved since 3-7-36 Refused further collapse. Asymptomatic working
19	J.C.	M	C	30	R	1	.....	3	San'm 5 mo.	13 mo.	Pos. sputum. X-ray—7 cm. cavity rt. upper	Well since 4-16-37. Refused further surgery. Cavity closed; sputum negative
20	E.E.D.	F	W	25	R	3	73 days 50 days	11	San'm 1 yr. Phren. 6 mo.	4 yrs.	Pos. sputum, hemoptysis. X-ray — 6 cm. basal cavity rt	Well since 8-8-36. Moderate kyphoscoliosis; no complaint
21	A.K.	M	C	20	L	2	19 days	11	San'm 9 mo. Phren. 2 mo. Thoracotomy 2 mo.	19 mo.	Pos. sputum, chills, fever. X-ray—multiple cavities to 4 cm. with mixed empyema left	Well since 4-16-37. Syphilis 4 plus, controlled by mapharsen. Open thoracostomy necessary for tension pneumothorax. Oleothorax P.O. for empyema pocket
22	E.V.Mc.	F	W	23	L	3	21 days 35 days	7	San'm 2 yrs. Pneum. 18 mo.	4 yrs.	Pos. sputum. X-ray—4 cm. cavity left upper	Well since 1-22-36. P.O. pulmonary embolus third stage. Recovery
23	Z.L.P.	F	W	31	L	3	49 days 27 days	7	San'm 10 mo. Pneum. 8 mo.	20 mo.	Pos. sputum. X-ray—cavity left upper. Inefficient pneumothorax	Well since 2-27-38. Closed pneumolysis unsuccessful—2 attempts
24	H.M.H.	F	W	25	R	2	36 days	5	San'm 18 mo.	20 mo.	Pos. sputum. X-ray—honeycomb rt. upper	Well since 5-14-37
25	M.K.G.	F	W	25	L	2	85 days	6 with scap.	San'm 3 yrs. Pneum. 4 yrs.	4¾ yrs.	Pos. sputum. X-ray—10 cm. cavity left upper. Honeycomb rt. apex	Improved since 2-17-37. Large cavity closed. Needs bilat. collapse but refuses. Pneumolysis failed
26	M.V.L.	F	W	32	R	2	8 mo.	5	San'm 3 yrs. Phren. 1 yr.	3½ yrs.	Pos. sputum. X-ray—multiple cavities to 4 cm. upper rt.	Well since 3-26-37
27	A.C.L.	F	W	24	R	4	145 days 30 days 30 days	8 with scap.	San'm 5 yrs. Pneum. 2 yrs.	7 yrs.	Pos. sputum. X-ray—12 cm. cavity rt. upper	Well since 3-3-37. First stage ineffective Wilms-Sauerbuch. Anterior stage done. Had P.O. third stage lobar pneumonia. Recovery
28	L.D.	F	W	31	L	2	20 days	11	San'm 10 yrs. Phren.	10 yrs.	Pos. sputum. X-ray—diffuse honeycomb whole left. Hemoptysis	Well since 8-14-35. Extensive 5-rib first stage—graded second stage
29	C.M.M.	F	W	40	R	3	140 days 39 days	5	San'm 11 yrs.	14 yrs.	Pos. sputum. X-ray—honeycomb upper rt. marked fibrosis	Well since 3-30-38. Limited vital capacity (800 c.c.) requiring single rib removals
30	E.M.C.	F	W	34	R	2	53 days	5	San'm 16 mo. Phren. 7 mo.	1½ yrs.	Pos. sputum. X-ray—8 cm. cavity rt. upper	Unfinished. Improved since 3-1-38

* Sanatorium regimen.
† Pneumothorax (artificial) previous to surgery. All cases had trials, mostly failures.
‡ Phrenic interruption on the side operated (temporary).

Transverse processes are removed where the cavitation is large or centrally located. Generally speaking, basal cavities are more difficult to close than apical cavities of comparable size. Resection is not so radical is cases where honeycombing was the sole lesion; every effort is made to leave the patient with as much breathing space as possible. On the other hand, some cases require additional anterior collapse.

We have found ethylene-oxygen-local the anesthetic agent of choice. Patients are urged routinely to rid the trachea of secretions before the induction of anesthesia and again before leaving the operating room. To facilitate this, the operation is carried out in slight Trendelenburg position, and the patient placed in bed for four hours in this position. A small dose of nembutal is given the night before surgery and morphine or pantopon immediately before the operation. No atropine is given as it tends to thicken secretions. Operating time is reduced to a minimum without sacrificing careful technique. Patients are given glucose in saline routinely postoperatively and occasionally acacia is added where the pulse volume is weak. In no instance have we had to give transfusion of blood, but we would recommend it where there has been much blood loss. A soft diet is encouraged by the second or third day and the patient allowed a back rest by the fourth day. As a rule, most patients are out of bed by the eighth day. We have always encouraged our patients to be ambulant at least a week before operation. Oxygen is given if cyanosis or dyspnea develops.

While the series of cases we are reporting is not large, we believe it to be significant of nearly every type of surgical tuberculosis encountered. Moreover, unlike sanatorium cases, most of these patients elected surgery as private patients, and not a few were operated on in general hospitals. In the series there were seventeen male and thirteen female patients; twenty-six were white and four colored. All but one were classified as far advanced cases. All had had previous sanatorium management, the average duration of which was thirty-four months. The average duration of symptoms was 4.2 years; one patient with cavernous tuberculosis had been treated expectantly for fourteen years. The left side was operated on in fourteen patients and the right is sixteen. Eight patients had one stage, fourteen had two, six had three and two had four stages. There was one supplementary anterior thoracoplasty. The average number of ribs removed was 5.7. The average interval between stages was forty-five days; this was computed after discounting instances where the interval was 145, 192, 240, 596 and 665 days in patients who could have been operated sooner but who had to defer surgery because of circumstances beyond their control.

The results of our series were gratifying. There was no mortality; moreover, eighteen patients, or 60 per cent, were cured, ten, or 33 per cent, were improved, and two were unfinished at the time of this report. Of the improved classification we believe that the majority could be made eligible for cure if they elected further surgical collapse. Sooner or later recurrence of symptoms is bound to occur, and we strongly urged such patients to continue treatment with this in mind. One patient had severe diabetes with blood sugar levels before operation as high as 420 mg. per 100 c.c. However, no complications occurred in this case, and the patient subsequently underwent a bilateral cataract operation with like success. It was interesting to note that the insulin requirement in this case was reduced from 150 units daily before operation (when the patient was bed-ridden) to 35 units postoperatively, and this in spite of a gain in weight, increase in diet and a marked increase in energy output. All patients had sufficient vital capacity except one whose measure was 800 c.c. In this case as in another incomplete case, operation was carried out by single rib removals to insure recovery.

There were various sized cavities in this series, the largest being 10 by 12 cm. We have tried to emphasize that any lesion

comprising 25 per cent pulmonary tissue in one lung must have permanent collapse, and it is our feeling that much of the honeycombing that we see is due to re-expansion of inadequately collapsed cases of artificial pneumothorax. Hemoptysis was a common complaint in such cavity cases and it frequently persisted for some time after operation. One patient had had twenty-five severe hemorrhages before coming to surgery. Another was subjected to the old Wilms-Sauerbruch operation for a relatively large cavity; this took three stages of secondary thoracoplasty for eventual closure. Our aim was cavity closure in each instance so that the walls of the cavity would be held closed permanently after fibrosis was established.

There was but one case of postoperative flare-up with recovery. Any sign of exudative inflammation as evidenced by interval *x*-rays was sufficient to postpone further surgery. There was one postoperative pulmonary embolus with recovery. One patient had a postoperative wound infection which we believe came from a crust at the site of a previous scar. In this regard, we emphasize rigid asepsis both before and at operation. Green soap and water, repeated, then ether and mercresin constituted our routine.

CONCLUSIONS

We have not presented anything new in the surgical management of pulmonary tuberculosis. However, we wish to re-emphasize certain conclusions which we believe must be accepted if good results are to be obtained.

1. The type of operation has been well standardized and is relatively safe; there were no deaths in this series of consecutive cases representing sixty-two stages of operation.

2. There are certain requisites for surgical collapse as well as for surgical risk. Contralateral disease is no contraindication; as a matter of fact, the unoperated side seemed to improve with each stage of operation where involvement had been the result of cross infection from the involved side.

3. Minimal sacrifice of pulmonary tissue but sufficient collapse for cavity or honeycomb closure is paramount.

4. The results of this series of cases are encouraging. Although only 60 per cent of our patients are well,* the 33 per cent who were improved are eligible for the "well" category if they can be persuaded to elect further surgical collapse. There were no unimproved patients in the series.

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*The term "cure" has been used synonomously with "well." This does not conform to the symbol as used by the National Tuberculosis Association.

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Closed Pneumolysis in Pulmonary Tuberculosis

Case Report

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IT IS well recognized that collapse therapy holds an important place in the treatment of pulmonary tuberculosis. Generally speaking, those patients who can be afforded an efficient method of collapse have an 85% chance for clinical cure; without it, the ratio is reversed and only 15% recover from the disease. However, it must be emphasized that the collapse in question be adequate. Lesions comprising more than 25% of pulmonary tissue in one lung must for the most part be permanently collapsed, lest re-expansion of the arrested process reopen a poorly fibrosed lesion.

ARTIFICIAL PNEUMOTHORAX

Probably the most universal method of producing collapse in tuberculosis is by artificial pneumothorax. This method for the most part is easily induced by the average chest physician and is fairly well tolerated by the majority of patients. Until recently, the question of how well the collapse was induced did not enter the equation until large series of cases were reviewed. In 850 pneumothorax cases Matson found that after 15 years of those who had an efficient collapse only 21% were dead; of those who had only partial collapse 50% were dead.

What percentage of artificial pneumothorax cases can we then call failures? Although the figures of various authors vary, most men will agree with Cutler in the statement that 40% are inefficient. Of these latter cases, it is possible to convert approximately 70% to efficiency by the operation of closed pneumolysis. Every case of chronic pulmonary disease sooner or later develops pleuro-pulmonary adhesions. In those cases where the disease process is more parietal, the adhesions are most abundant. The presence of such adhesions, although protective from a pathological viewpoint, prevents collapse over portion of the lung when induced. Moreover, these adhesions are always in a critical location when collapse is found to be inefficient; either they lie over a poorly collapsed area of disease, a cavity or often a whole lobe or a lung. In many cases the mediastinum is pulled to one side by the presence of these adhesions; nature is trying to induce collapse by whatever route possible.

CLOSED PNEUMOLYSIS

Closed pneumolysis is one of the methods for cutting such adhesions, and of, therefore, converting an inefficient pneumothorax to efficiency. There are certain rules that one must heed before electing such a procedure:

1. The case must have an adequate trial at pneumothorax for from three to six months to determine which adhesions will stretch spontaneously. This interval of time gives the patient a few months of recumbency in which to improve general resistance.

2. There must have been a proper election of pneumothorax. In other words, the case must be a curable one.

3. There must be sufficient collapse to enable the instruments to be introduced.

4. Adhesions must be of a critical nature. This can only be ascertained after thoracoscopic study of the thoracic cavity. In general, there are three types of critical adhesions: (a) those which overlay a cavity; (b) those over honeycombing or a poorly fibrosed lesion, and (c) those which will eventually re-expand that portion of the lung they overlay in spite of positive pressure pneumothorax.

5. Adhesions must be of the type that can be safely severed. This can only be ascertained by study with the thoracoscope.

All men concerned with pneumothorax agree as to dangers of stretching adhesions. With positive pressure many adhesions will tear from the chest wall, but if the tear is from the lung tissue, empyema and broncho-pleural fistula result. It is impossible to tell which adhesions contain lung tissue in x-ray studies. Cutler found that only 67% of adhesions were shown in x-rays in a series of 200 selected cases. Again, many adhesions contain large blood vssels, and a tear with hemorrhage may result. As to type, adhesions may be strings, cords, fan-shaped, webs, bands and tent-shaped. Each adhesion must be studied individually, although, as a rule, it is rare to find lung or blood vessels in a string adhesion.

There are many technical considerations which must be kept in mind. First of all, a thorough knowledge of the structures of the thorax is essential. One must choose the most advantageous location for introduction of the thoracoscope and electrode so that the greatest number of adhesions will be accessible. Adhesions must be in view at all times during the process of cutting. Frequently, if an adhesion is not deemed safe to cut, repeated coagulation in stages will accomplish considerable necrosis and ultimate stretching. The patient must be watched for excessive collapse at any one time; such patients have high fever after a day or two from auto-tuberculinization. We do not hesitate

to have oxygen nearby for use at the operating table or at the bedside later.

Most patients have very little post-operative reaction. Effusion invariably results but is of no consequence, and is readily absorbed. Purulent effusion results from cutting through active pleural tuberculosis. Subcutaneous emphysema occurs frequently, but is not over-discomforting and subsides in a few days. Refills of air are resumed as before the pneumolysis. It will frequently require less air due to better collapse. We encourage patients to be out of bed after five days, and back to their pre-operative routine in ten days.

The mortality is negligible. We have had no mortality in a series of 32 thoracoscopies. Of this number 6 were abandoned due to the nature of adhesions. 1 of these was found to have a concommitant metastatic carcinoma of the pleura. Of those who were subjected to pneumolysis 21 were successful, 3 had fair results and 2 were unimproved. Of these latter 5, 2 patients died, 1 from contralateral spread a year later, and 1 from spontaneous collapse eight weeks later. 1 patient was referred for thoracoplasty, and the others are still unsuited for radical collapse therapy. Of the successful group, the adhesions were holding open in a cavity in 16 cases, honeycomb area in 3 cases, and a re-expanding lesion in 2.

Some of the patients had other minor forms of collapse as phrenicectomy. We do not believe that a phrenic operation takes the place of the pneumolysis, nor is the reciprocal true. It is foolhardy to collapse undiseased areas of the lung when severing a few small adhesions will afford collapse to the diseased area. Moreover, phrenicectomy in a number of these patients held too much pulmonary tissue inactive that the patient needed for his vital capacity.

Pneumolysis must attack the whole lesion to be successful. If not, there are other methods of collapse that would probably be more suitable for the the case: as thoracoplasty, extrapleural pneumolysis, extrapleural pneumothorax, or even open pneumolysis. Matson was able to convert 66.9% of the lesions in 138 patients, and obviously, as in our series, the remainder were not suitable for the operation.

CONCLUSIONS

1. Closed pneumolysis is a safe method for cutting pleuro-pulmonary adhesions in tuberculosis.

2. The operation is reserved for about 30% of the cases of artificial pneumothorax which become inefficient due to adhesions.

3. A series of 30 cases is presented herein, in which it was possible to bring about successful results in 19, and improvement in 3 more. There was no operative mortality in the series.

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The Surgical Management of Biliary Tract Disease

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THE SURGICAL MANAGEMENT OF BILIARY TRACT DISEASE

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ADVANCES in the surgical management of gallbladder and biliary tract disease have been so remarkable within the last quarter century that textbooks are obliged to modify treatises on the subject with each edition. The lines of progress have been in many directions: our knowledge of the physiology of the liver, biliary passages and bile have been augmented, the preoperative and postoperative management of patients has been better standardized, technical advances in the operative work itself has enabled recovery in hazardous cases, and morbidity and mortality statistics have been lowered appreciably. It is our intention to recapitulate these advances and to emphasize the role they play in the management of one's patients; in so doing we are presenting a series of personal cases to exemplify their clinical application.

PHYSIOLOGIC CONSIDERATIONS

The foundation of good results in the management of biliary tract disease is a modern knowledge of the physiology of the liver. One of the most important functions of the liver is concerned with the storage of dextrose as glycogen and releasing it again into the blood stream when demanded. Hepatectomized animals die after a few hours with a rapid fall in blood sugar. If glucose is given intravenously, death can be delayed as much as 24 hours. On the other hand, if as much as seventy per cent of the liver is removed, the remaining portion will not only carry on the demands of the animal but will have regenerated the excised portion within a few weeks.

Another of the functions of the organ is concerned with protein metabolism. Amino acids find their way to the liver by way of the portal vein. Some of them are converted to glucose and urea through intermediate products of lactic acid and ammonia respectively. Others are utilized as such and some investigators maintain that the protein molecule is resynthesized within the liver. After hepatectomy the blood urea level falls progressively provided renal function is not impaired. With bilateral nephrectomy, the blood urea level remains unchanged.

The liver is concerned with other important metabolic processes to which we shall refer from time to time: namely, mineral metabo-

lism, bile pigment metabolism, fat metabolism, the formation of fibrinogen and other essential clotting elements, detoxification of certain poisons and drugs, and the regulation of the plasma-cell ratio in the blood. With regard to the latter, febrile states reduce plasma concentration in the circulation, but this does not occur after denervation of the liver. The detoxification of poisons and drugs is a chapter in itself and we shall refer the reader to the experimental studies concerning phosphorus, barbiturates, salicylates, uric acid, benzoic acid, allantoin, galactose, lactic acid, strychnine, nicotine, polypeptides, quinidine, cinchophen, and many others.

The reticulo-endothelial system has within its ramifications in the liver a highly specialized cell in the so-called star cells of Kupffer. It is here that bilirubin is formed from the breakdown of hemoglobin. This is not the only source of bilirubin for it is also elaborated by the reticulo-endothelial cells of the bone marrow and spleen. The bilirubin is excreted in the bile together with cholesterin, bile acids and bile salts. Animals who are deprived of their bile through biliary fistulas die within a few months with abnormalities of the bones associated with a loss of inorganic constituents. Their stools become fatty and clay-colored and an excessive putrefaction develops with the ensuing diarrhea. If the spleen is removed in such animals, death comes much sooner, apparently from a reduction in hemoglobin. Bile as it is formed in the hepatic lobule differs from that found in the gallbladder where it is stored; the former is thinner and light yellow in color while the latter has a heavier specific gravity and a dark green color. Moreover gallbladder bile contains more base, more bile salts, more calcium, and is definitely acid in reaction, while liver bile has more carbonate, more chloride, and is alkaline in reaction. The flow of bile acids may be augmented mainly by the administration of bile salts and to a less extent by secretin, a hormone (Ivy) elaborated in the duodenal mucosa. Bile not only lowers the acidity of the gastric juices but it is necessary in emulsification of fats in digestion and in activating steapsin, the lipolytic enzyme of the pancreas. Jaundice occurs when the balance between bilirubin formation and bilirubin elimination is disturbed. This comes about in two ways: in the retention type, bilirubin is bound up with the plasma proteins producing an indirect Van den Bergh reaction as we see in congestive heart failure, lobar pneumonia, and hemolytic jaundice. Such bilirubin is not excreted by the liver, and there is a concomitant cloudy swelling of the kidneys preventing its renal excretion. In the obstructive form, the bilirubin is excreted by the bile canaliculi, but due to the back pressure exerted by obstructions of the duct in lithiasis, inflammation and neoplasia, it cannot reach the intestine. The bilirubin thus formed remains uncombined and produces a direct Van den Bergh reaction which

can be eliminated from the kidneys as urobilinogen or unchanged bilirubin.

The release of bile into the duodenum is controlled by the sphincter of Oddi which surround the ampulla of the common duct at its terminal portion. The sphincter will withstand a pressure of 300 mm. of bile without relaxing when there is no digestion taking place. However, when the pressure reaches 50 to 70 mm. the valves of Heister in the cystic duct relax and allow the bile to enter the gallbladder. The gallbladder will in turn develop a pressure as high as 300 mm. but only 100 mm. is necessary to cause the sphincter of Oddi to relax. This would not indicate that there is a reciprocal innervation which relaxes the sphincter when the gallbladder contracts.

The functions of the gallbladder are those of absorption, contraction, and secretion. Bile is formed normally in amounts from 500 to 1000 c.c. daily. After storage in the gallbladder it is concentrated from 500 to 900 per cent by removing water and inorganic salts. Any inflammatory process of the mucous membrane may inhibit its powers of absorption and concentration. Papillomas of the gallbladder may increase this power by increasing the mucosal surface. Riegel and his associates have found that the gallbladder will absorb water much more quickly than inorganic or bile salts, and Ravdin found that sodium chloride and potassium iodide were absorbed promptly. The most potent stimulant to gallbladder emptying is egg yolk. Fatty substances also exert this influence to a less extent and the natural means for its contraction is provided in a hormone of the duodenal mucosa. Extirpation of the gallbladder results in the adoption of its functions by the bile duct system. Hepatic bile is concentrated within the ducts and released as needed for digestion.

Pathologic Considerations

Cholecystitis and hepatitis are diseases peculiar to man. Either can be produced experimentally in animals by the intraperitoneal introduction of Dakin's solution. Judd pointed out that cholecystitis is a local organ manifestation of a disease which affects the whole biliary tree. Any consideration of a patient with impairment of the function of the gallbladder must entail an investigation of the biliary ducts, common duct and pancreatic ducts. Infection of the gallbladder reaches the liver and pancreas through the lymphatics or directly through the biliary tree. Infection of the biliary tract produces stasis and obstruction, and with a deranged cholesterin metabolism, there results the nucleus for gallstone formation. Frequently one sees fine deposits of cholesterin in the submucosa of the gallbladder which are particularly frequent during pregnancy when the blood

cholesterol is high. Gallstones may be present without infection of the gallbladder. Cholelithiasis is noted in 50 per cent of the cases of chronic or hemorrhagic pancreatitis, cyst of the pancreas, and in chronic hemolytic jaundice. Moreover, cholecystitis may be produced by injection of pancreatic extract into the gallbladder. When one cultures gallstones, organisms are recovered in about 30 per cent of cases. Cultures of bile are positive in 15 per cent of the cases, cultures of the gallbladder wall in 48 per cent, and cultures of the adjacent lymph nodes in 80 per cent. Thus, many avenues are open for elaboration of theories of the origin of cholecystitis.

Diagnosis

In arriving at a diagnosis of cholecystitis with or without associated biliary tract disorders, we rely on four important criteria. Fair, fat and forty is no longer the axiomatic triad; we see more patients in the second and third decade and again in the sixth and seventh decades than in the former age group. We are cognizant of the many adjuncts of the laboratory together with the vast symptomatology which may be attributed to biliary dyskinesia. We do not feel that any of them is diagnostic without one of the four manifestations.

1. *Pain.* Results of surgery in biliary disorders is apt to be discouraging when pain is absent. These patients complain of pain following the ingestion of a meal rich in fried or fatty foods. The pain is usually in the right upper quadrant and frequently radiates to the shoulder and back. The history of pain frequently patterns that of peptic ulcer with its periodicity, seasonal variation, even to the point of relief with the taking of food or soda. Needless to say, diagnosis rests on the failure of the roentgenologist to demonstrate an ulcer niche, together with other informative diagnostic aids. If calculi lodge in the ampulla, actual ulceration of the duodenum may take place with both syndromes of ulcer pain and biliary tract pain present. The pain is usually due to the spasm of the sphincter of Oddi which has been initiated by the irritation of a calculus, inflammation or neoplasm. Our attention has been called to the type of colic which simulates angina pectoris where removal of the gallbladder brings relief of pain. We are ever conscious of the reciprocal observation when coronary disease produces epigastric pain, and not a few cardiac patients have parted with their gallbladders to no avail. McGowan, Butsch, and Walters have found nitroglycerin as an aid in differentiating biliary tract pain from that arising from other sources. Morphia increases the spasm in the sphincter, raising the intraductal pressure and thereby augmenting the pain; nitroglycerin affords prompt relief as a rule. Sometimes a pericholecyst-

itis will have produced adhesions to the colon or small bowel with symptoms of obstruction. The degree of pain may be unreasonable in cholecystitis. It is interesting to note the number of patients in whom little is found at the operating table. Again, there are those who experience little or no pain and in whom the pathologic process is advanced. In this regard we call attention to the so-called "silent stones."

2. *Tenderness under the right costal margin.* Tenderness is significant only when pronounced. It may be accompanied by jaundice but the presence of the latter is not diagnostic; it merely places one on his guard and forces him to rule out the biliary tree in the differential diagnosis. Deep pressure in eliciting tenderness may be misleading due to the proximity of other important viscera in the region, namely the hepatic flexure of the colon, the duodenum, and the right kidney.

3. *Cholecystograms.* When roentgenograms are positive, they are diagnostic alone in 95 per cent of the cases. Along with positive roentgenographic evidence, we see another 18.5 per cent in whom definite disease is found at operation, but who have been reported with normally functioning gallbladders. When the history of pain is lacking, we have come to put a lot of faith in a negative cholecystogram. What we want to emphasize particularly is that the roentgenogram does not always localize the part of the biliary tree affected just bcause the dye was improperly concentrated. It does not often portray those cases in which malignant change has taken place, and the surgeon should be ever mindful of this in undertaking exploration.

4. *Laboratory adjuncts.* We refer particularly to the Van den Bergh reaction which may be significant of surgical disease especially when blood bilirubin values are high. There are many other laboratory aids namely, galactose tolerance test, bromsulphthalein liver function test, the Quick hippuric acid test, quantitative fibrinogen studies, quantitative blood iodine, a study of clotting properties, estimations of the bile in the urine, urobilinogen, analysis of the stool, icteric index, blood amylase, blood smears, and many others. There are some who rely considerably on the Lyon-Meltzer test where bile is recovered from the duodenal tube and a diagnosis made from a study of its chemical properties. Although this test is helpful to some degree, we do not rely on these findings alone. A study of the properties of the bile is quite essential, however, in the postoperative management of some cases.

Selection of Patients for Operation

In advising operation for biliary tract disease, we take the stand that all stone cases are surgical if the condition of the patient is

satisfactory. Even if there are no symptoms they frequently give trouble later in life when the condition of the patient may be worse. We also advise operation in cholecystitis where there is some doubt concerning the diagnosis. Moynihan once said that he always advised surgery because he did not believe any man was infallible in his diagnosis. In recent years a great deal of discussion has arisen concerning operation in the acute phases of cholecystitis. Totten reported a mortality of zero when he operated within the first three days, whereas his total mortality was 13 per cent. We advocate early operation, and believe that the risk is less if done before forty-eight hours. In delayed acute cases, we rely upon clinical improvement of the patient together with an approach to normal in the leukocytic and sedimentation responses before advising exploration.

In order to determine hepatic function and to have an index of safety of operability, we employ the Quick liver function test. Like Boyce, we believe it forewarns us of those patients who are subject to fatal complications allied with "liver death." This entity was first brought to our attention by Heyd in 1924. Occasionally, after a seemingly simple operation on what was considered a good risk patient, death resulted without apparent warning. The exitus came about in one of three ways. The first group died after a few hours with high fever, lowered blood pressure, and a hepatic insufficiency in a somewhat related anaphylactic death. The second type died after a period of days with anuria due to renal failure, where only cloudy swelling could be demonstrated in the kidneys and liver at necropsy. The third group was an intermediate type of the other two. These patients all had a low hepatic reserve and a direct relationship has been experimentally shown between the liver and kidneys when death comes about through other apparently related causes, namely, thyroid crisis, intestinal obstruction, burns, and adrenal insufficiency. The Quick test has been shown to produce no burden on a damaged liver and give us an index as to the reliability of the liver's detoxifying powers.

Elderly patients stand major procedures well, provided the cardiovascular-renal reserve is adequate. Hypertension per se does not add to the gravity of the prognosis. McQuiston showed conclusively that hypertensives did as well as hypotensives or those with normal blood pressure, provided, of course, there were no vascular changes. Brooks reported a series of these patients in whom the operative mortality was 10 per cent.

Preoperative Preparation

1. *Glucose.* Since the liver is the chief source of available glucose in the form of readily assimilable glycogen, and inasmuch as the

ordinary laparotomy reduces liver function by as much as 25 per cent when no glucose is given preoperatively, we are particularly anxious to supply an ample quantity to gallbladder patients. Althausen showed how the liver could be literally forced to take on a store of glucose, and Coller and Jackson recommended the dextrose tolerance test as a guide in determining the liver's carbohydrate metabolic powers.

2. *Fluids.* A great many of these patients are in negative water balance on admission due to fever, vomitus and diminished intake. Like Coller and Maddock, we advocate a daily intake of 3500 to 4500 c.c. to carry on normal excretion. One should be governed by the urinary output in administering fluids. Ordinarily, we try to enforce a renal excretion of 1000 to 1500 c.c. daily.

3. *Transfusion.* Many of these patients are anemic. Not only does fresh blood meet the demands of their inadequacy but may furnish other mineral and nutritional properties which may be lacking.

4. *Bile and vitamin K.* The bleeding in jaundiced patients has been laid to a prothrombin deficiency. The administration of bile and vitamin K obviates this prothrombin reduction. When the clot of these patients is examined, it appears large and boggy and does not retract properly. This is due to the retention of portion of the serum, and such a clot is inefficient in stopping hemorrhage since it allows the blood to seep through slowly.

5. *Oxygen.* Judd emphasized the value of administering oxygen to patients with jaundice. It not only increased the oxygen saturation curve of the blood with increased oxygenation to the liver cell, but frequently prevents pulmonary complications. Schweigk has shown that decholin (dehydrocholic acid) will also increase the blood flow through the hepatic artery and hence increase the oxygen saturation curve. Winfield obtained similar results with dessicol. This results in a choleresis and diuresis which may or may not be of value in inflammatory states. We do not administer decholin when there is an obstructive lesion to the duct system.

Operative Technic

When the surgeon takes these patients to the operating room, he must be prepared to examine not only the gallbladder, but the liver, ducts, pancreas, spleen and appendix as well. We have used the Kocher-Mayo incision routinely as it gives adequate exposure to all structures pertaining to the biliary system. An advanced degree of hepatitis or cirrhosis may change the plan of operation entirely. In hepatitis, the liver appears swollen, smooth and green-

ish-yellow with a rounded presenting edge. Biliary cirrhosis, on the other hand, presents an atrophic, scarred liver with a granular surface. Varying amounts of ascites may be present. Patients who exhibit considerable liver damage are apt to have a stormy convalescence and the surgeon must undertake to do the surgical procedure which will afford the least trauma and the most adequate method of drainage. Gallbladder surgery has metamorphosed from an era of simple lithotomy by Robbs in 1867, through the two-stage drainage operation of Kocher and the one-stage cholecystostomy of Sims in 1878, to the first cholecystectomy by Langenbuch in 1882. Even so, cholecystostomy still held full reign until about 1915 when it was noted that many of these patients returned for secondary operations. We now prefer cholecystectomy whenever possible. Regarding the technic of removal of the gallbladder, we believe that the retrograde method has been fairly well standardized. In this way the cystic duct with its possible congenital abnormalities may be well isolated and the danger of hemorrhage from neglect to the cystic artery is obviated.

There are but few indications where simple drainage is employed. When the inflammatory process is so acute that the gallbladder cannot be safely shelled from its fossa, or when the nature of the obstruction is such that the gallbladder may be needed for short-circuiting procedure to the stomach or duodenum, cholecystostomy is used. Otherwise its resultant morbidity is 155 per cent higher than the expected rate according to Dublin. We advise gradual decompression in cholecystostomy as suggested by Ravdin to prevent sudden hyperemia of the liver with possible failure.

When the operator finds a dilated common duct, exploration of the duct is mandatory. Oftentimes one will find the same inflammatory process in its mucosa as found in the gallbladder. The stasis and infection in the biliary tree accounts for the pain that frequently persists in noncalculous cases when drainage of the duct is not instituted. A scoop passed upward into the hepatic ducts and downward into the duodenum will rule out duct stones or strictures. In choledochostomy, a gradual decompression is the rule again. One should always palpate the pancreas in these cases. If pancreatitis is present, it will have a firm consistency but not the irregular induration that goes with malignancy. At times a definite diagnosis cannot be made. Drainage of the common duct is the most effective treatment known for inflammatory lesions of the pancreas and severe grades of hepatitis, a good proportion of which are secondary to inflammation or obstruction of the duct. Walters has employed a radio-opaque substance at the operating table to visualize the biliary tree and reveal any evidence of doubt concerning stones. We advise opening the common duct for ade-

quate exploration when indicated, rather than to do an exploration through the cystic duct which may be inadequate. Drainage of the peritoneal cavity is almost always done. Only in a single case have we closed the abdomen without drainage.

Postoperative Measures

Postoperatively these patients receive a continuation of their preoperative measures. Particular attention must be given to adequate amounts of glucose and fluids. We employ transfusion and oxygen without delay if there is the slightest indication. We pay particular attention to the lungs and utilize measures to prevent atelectasis and pneumonia. The Trendelenburg position, carbon dioxide inhalations, intratracheal suction and even bronchoscopy have been used.

Complications

Judd reported the complications of biliary surgery. Death was due to pulmonary causes in 38 per cent, peritonitis in 13 per cent, liver or kidney failure in 13 per cent, hemorrhage in 11 per cent, liver abscess in 8 per cent, pancreatic abscess in 3 per cent, and other causes including shock in the remaining 7 per cent. Our present day preoperative preparation has reduced the dangers of hemorrhage and liver failure to a large degree, and certain postoperative measures have lowered the mortality from pulmonary complications. When drainage through a T-tube has been employed, and when other lesions have been attacked beside the gallbladder, the mortality has been higher. Complications may arise from the too early removal of the T-tube. Payne has shown that the chemistry and physical properties of bile is a good criterion for removal of the tube. Other investigators have made use of a study of intraductal pressures in determining when to remove the tube. We have found that injection of the T-tube with radio-opaque oil is of value in determining if there is any obstruction in the duct.

Results

In our personal series of sixty-seven cases, cholecystectomy was performed in sixty-five, cholecystostomy in two. The common duct was opened and drained in ten cases. Intestinal anastomosis of one form or another was done concomitantly with the gallbladder operation in four patients for conditions related to ulcer, duodenal dilatation or intestinal obstruction. Two patients who were cholecystectomized had previous cholecystostomies without relief, and one patient had a previous cholecystectomy with evidence of a common duct stone remaining.

In the two cases in which drainage of the gallbladder was employed, the indications were those of severe acute cholecystitis and hepatitis in a poor risk patient and liver abscess in the other. Drainage of the common duct was carried out where it was dilated, where there was evidence of pancreatitis, or where there was a severe grade of hepatitis. Of the ten patients so treated, eight had severe hepatitis, three had common duct stones, seven had cholangitis, five had pancreatitis, and three had cirrhosis.

In seven of the cases there was acute cholecystitis; in three of these the gallbladder was gangrenous and perforated; in the other three acute empyema of the organ was present. Other pathologic processes found were of interest; there was 1 case of hydrops, 2 of papilloma, 1 of adenoma of the fundus, 1 of gallbladder, 1 chronic empyema, 1 cholecystduodenal fistula (spontaneous), 10 of cholesterosis, 5 with pericholecystitis, 21 of stones in the gallbladder, and an additional 33 with minor grades of hepatitis.

Of the uncomplicated cholecystectomies the mortality was 3.9 per cent. The gross mortality for the group with and without complications was 7.5 per cent. In the seven acute cases subjected to removal of the gallbladder, there was one death. The causes of death in the series were as follows: hepatorenal failure, 2; pulmonary embolism, 2; sepsis, 1. Of the patients surviving, 32 considered themselves cured; 18 were greatly improved with no residual pain; 5 were improved but had occasions of distress unrelated to the biliary tract, and 3 were untraced. Of the 5 whose results were mediocre only one was found to have stones.

Conclusions

1. Surgery should be employed in patients exhibiting biliary tract disturbances who received little benefit from medical regime.

2. The presence of stones or the suspicion of malignancy demands surgery.

3. One should keep in mind the physiology of the biliary system in preparing his patients for operation; we refer specifically to certain liver function tests which will evaluate surgical risk in many cases.

4. Cholecystectomy is the operation of choice. Drainage of the common duct is imperative where there is cholangitis, duct stone, pancreatitis, or severe grades of hepatitis.

5. In cases of acute cholecystitis seen within the first 48 hours, the results of cholecystectomy are excellent.

6. The results of biliary tract surgery are exemplified in a series

of sixty-seven personal cases wherein the gross mortality was 7.5 per cent.

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Spontaneous Pneumothorax

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Spontaneous Pneumothorax

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The rather frequent occurrence of spontaneous pneumothorax in the practice of the physician, surgeon, and lung specialist merits its renewed consideration from time to time. Ofttimes its introduction to the practitioner is in its distressing bilateral form, when it would tax the resourcefulness and alacrity of the keenest diagnostician and therapeutist.

Ever since Laennec's treatise on pneumothorax, the probability of a tuberculous etiology has been maintained by many, and even as late as 1915 Cummer postulated that all cases had a latent tuberculous focus which was not readily demonstrable. The fact that other predisposing causes were probable was not well believed until recent years, when definite protocol findings helped to substantiate the so-called idiopathic group and to reveal some of its true pathology.

The present-day concept of spontaneous pneumothorax is not altogether clear. The term "spontaneous" has reference to the collapse produced by some pathologic process as distinguished from that artificially produced. This would seem to include those cases allied to trauma. We have realized the ambiguity of the term and have preferred to designate the pathologic process, the disease entity, and the mode of origin in order to further clarify its meaning.

Spontaneous Pneumothorax:

1. Exogenous
   - Accidental
   - Operative
2. Endogenous
   - (process) Adhesions
     - Blebs
     - Necrosis
   - (disease) Tuberculosis
     - Carcinoma
     - Cystic disease
     - Other inflammations

One can readily see that the majority of cases are the result of endogenous causes. This process requires a force from within the thorax, such as a cough, sneeze, severe muscular pull, or a deep inspiration which shifts the lung suddenly within the thorax. This mechanism requires a pathologic corollary to effect pneumothorax, i.e., a defect in the lung surface. These defects have been repeatedly demonstrated at autopsy and in life through thoracoscopic view, and exist in the form of (1) adhesions, (2) blebs and (3) necrosis. Adhesions may be due to any inflammatory process of the pleura and probably more than half of those seen are tuberculous. In this instance, they usually occur in advanced disease where the pleural reaction has been diffuse. The constant pull of an adhesion upon the lung represents a foundation for pneumothorax. Frequently, the adhesion is directly on a cavity wall and it would not seem difficult to explain empyema following such a pneumothorax. Ofttimes the adhesion produces its tear after a pneumothorax refill, when it is aided by a less negative counterpull of the intrapleural space. When empyema occurs, it frequently requires surgical drainage because of secondary infection from bronchial secretions. Bronchopleural and bronchocutaneous fistulae are frequent sequellae therefrom. Of less frequent importance is cystic disease of the lung due to its comparative rarity. Here the mechanism is usually a rupture due to the pull of an adhesion upon the cyst wall. In malignancy, the adhesions are relatively of the same import as in tuberculosis, but they are as a rule not as prevalent or, if occurring, not as tough. Blebs, on the other hand, may be of two varieties: (1) the scar-tissue type which predominate at the apex and (2) the emphysematous type which occur on the lung border. The former are fluid-containing in their genesis and produce secondary scar and adhesion formation. The latter are air-containing and rupture due to increased intrapulmonary pressure. They are frequently seen in children with bronchopneumonia where there are patches of consolidation or collapse interspersed with areas of emphysema. Congenital cysts represent a different mechanism due to the size of the bullae which usually produce scar tissue.

A less frequent occurrence of pneumothorax from tuberculosis is seen in the spontaneous type due to the rupture of subpleural tubercles following necrosis. Necrosis, on the other hand, is of more importance in causing collapse of the lung in carcinoma where there are diffuse pleural plaques of neoplasm. Necrosis is more widespread here than in tuberculosis, and it may result from either primary or secondary implantation. Needless to say, when carcinomatous pleural plaques are demonstrable, the neoplasm is inoperable.

Exogenous trauma represents the pneumothorax or hemopneumothorax produced by direct or crushing blows to the chest. One sees it frequently from fracture of a rib where a projecting fragment of bone has perforated pleura and lung. Exogenous causes from penetrating wounds do not usually produce tension, as the defect in the thoracic wall allows an outlet for the trapped air. In this category, we include postoperative and surgically induced pneumothorax. We have seen it follow accidental tear of the pleura at the first stage exposure of a two-stage operation for drainage of a pulmonary abscess. Thoracic surgeons are all familiar with the danger period following pneumonectomy or lobectomy when the bronchial sutures may fail to hold. Collapse here may be easily and rapidly fatal. Again the fear of cutting pulmonary tissue in thoracoscopies has forced the surgeon to abandon many a closed pneumonolysis. It may also complicate the dissection of a mediastinal tumor where the intrapleural approach is not contemplated. Lastly, it may occur on the side opposite the operation either on the operating table or some days later. Here it may be due to the distorted pleural pathology which brings the contralateral thorax into the field of operation, or may be the result of any other non-surgical entity we have mentioned.

When pneumothorax occurs, one or two complications may ensue. The tear in the lung may be of such a nature as to produce a valve-like action, allowing air to enter the pleural cavity, but not letting it escape. This produces tension and the mediastinum is soon shifted to the opposite side. Again, a tear may occur closer to the parietal than visceral pleura and involve the intercostal vessels. Hemorrhage in such cases may be profuse and rapidly fatal as the pleural space is not particularly helpful in restricting a clot to the injured vessel until blood has filled the whole hemithorax. The positive pressure of the space is no match for the systolic stream, and a tremendous burden is placed on the heart due to the hemothorax. The bleeding is always costal and never pulmonary in origin, for while the pulmonary portion of the adhesion is present, it can be seen to be covered by a layer of fibrin, and at autopsy, one never finds blood in the bronchi or lung parenchyma. Bloody effusions are usually indicative of malignancy or trauma, but as high as 15 per cent signify a tuberculous origin.

Spontaneous pneumothorax is most common between the ages of 20 and 40, but can occur anytime. Males are more susceptible than females, particularly in the traumatic group. As a seeming paradox, it may occur during sleep, but more often results after exertion. Many, including the tuberculous, have no premonitory symptoms beforehand, but once having occurred, recurrence is common. Most cases run a benign course and recede spontaneously in a number of days. Our concern is with those that often become complicated from the start. Usually, there is a sharp, stabbing pain in the shoulder or anterolateral chest. This pain can occur in the upper abdomen or loin and has occasioned difficulties in differential diagnosis from acute abdominal emergencies. In nearly all of the latter cases, ruptured peptic ulcer is suspected, and Rolleston reported nearly performing a laparotomy on one such case being saved only by his moribund condition. With the filling of the pleural cavity by air, dyspnea soon results which is more marked on exertion or by lying on the uninvolved side. There is no more predilection for one side or the other becoming involved. The rapidity of developing symptoms depends largely upon the size of the tear. If effusion occurs, it usually is seen on an average of 12 hours after the onset of pain. Not a few patients have had it occur bilaterally and one writer has seen successive spontaneous collapse on the same side within a few days in separate pleural pockets involving different lobes.

The physical signs are those of air within the thorax with absent or paradoxical motion on the affected side, absent breath sounds, and tympany. If there is an effusion present,

one may denote succusion splash, shifting dullness, and metallic tinkle. The displacement of the heart to the unaffected side is an important diagnostic and therapeutic guide. If hemorrhage is a concomittant, the signs of shock may supervene with a thready pulse, lowered blood pressure and peripheral vascular collapse.

One should not wait to prove his contentions by roentgenographic methods. Treatment, as a rule, is diagnostic and therapeutic aspiration with a 2½ to 3 inch needle thrust into the affected thorax. Air or fluid, or both, may be aspirated until the patient gets relief of dyspnea. One should always watch a change of pulse as a guide to too rapid removal of air or fluid. We advocate taking manometric pressures and palpation of the cardiac apex at all times. Very frequently, one finds it necessary to use continuous air aspiration with the underwater release. If there is blood present, we advocate its prompt removal in one or two sittings and air replacement with the exception of some 400 to 500 c.c. This maintains sufficient intrapleural pressure to discourage hemorrhage. We do not agree, as some contend, that bloody fluid be removed cautiously. We find that its presence produces a thickened pleura, wet atelectasis of the underlying lung and subsequent pneumonitis, and extreme pressure on the mediastinum. This latter mechanism can also be produced by organization of fibrin around mediastinal structures with eventual dilatation of the inferior vena cava. Leaving a large bloody effusion within the thorax also subscribes to empyema by leaving a good culture medium for bacterial growth. When aspirating, if one notes that the blood does not coagulate, it is sterile. Infected blood or tuberculous hemothorax, on the other hand, may show signs of clotting.

We also advocate making up blood loss with repeated transfusions. Some of these patients suffer greatly from anoxemia due to the blood deficit. Oxygen therapy should be available. If bleeding continues despite the neutral or slightly positive pressure, we do not hesitate to introduce a thoracoscope and locate the bleeding point for electrocoagulation. This requires the services of an expert, as it may even prove difficult at autopsy to find the focus of bleeding. If such a search is futile, one should perform open thoracotomy to ligate the intercostal bleeding. It need not be mentioned that absolute bed rest is a corollary to post-emergency treatment. If there has been a rupture of a tuberculous cavity, frequent aspiration may be mandatory due to the imminent nature of a mixed infection. One should not hesitate then to perform a closed surgical thoracostomy. Cultures will frequently be of aid, but the operator can usually recognize infection by the nature of the sanguinopurulent discharge.

In the course of subsequent therapy, non-expansion is the most probable difficulty encountered. We no longer advocate the instillation of 50 per cent dextrose intrapleurally as suggested by Spengler. If frequent withdrawals of air do not cause re-expansion within a reasonable time, we advocate the use of pure oxygen intrapleurally. Since the oxygen is absorbed by the pleura, there is a tremendous pull exerted upon the space which usually becomes obliterated within a few weeks. The disadvantage of using air lies in the nitrogen fraction which makes up 80 per cent and is not readily absorbed. The usual duration of re-expansion in these cases is 60 days, or it may be prolonged where there has been pleural thickening due to sanguinous effusion or underlying pulmonary pathology.

In obviating recurrences, we caution allowing the patient to be ambulatory between the fourth and eighth week, a time which is most important in keeping a minimal amount of motion when a firm symphysis of the pleurae is being established. It is usually the poorly organized cohesion of the site of previous rupture with surrounding pleura which predisposes to recurrence.

The authors have seen cases exemplifying all types of spontaneous collapse and wish to present a series of cases illustrating the mechanisms of each type.

Case Reports

Case No. 1—(Endogenous, bleb). A white male, aged 46, suddenly experienced a sharp pain in the right anterior chest while walking and immediately became quite dyspneic. He recalled having had an attack of "flu" some three months previous, which did not confine him to bed, but had left him with a moderate weakness and ease of fatigue. Examination by his personal physician revealed a typical spontaneous pneumothorax

on the right which his doctor treated conservatively. Within four weeks he suffered a recurrence of collapse with similar onset while ambulatory. In another two months one of us was called in consultation due to failure of re-expansion; he was still ambulatory. We immediately advised thoracoscopy which revealed a scar-tissue bleb over the right apex. Air was withdrawn at regular intervals, and no other treatment was advised except bed rest. Re-expansion was complete in five weeks and he was kept from working (and walking) for another four weeks. He has remained free of recurrence now for fourteen months.

Case No. 2—(Tuberculosis). A male negro, aged 20, was seen in the emergency room with severe dyspnea, absent motion in the left chest, and obvious distention of the left intercostal spaces. The apex beat was seen and felt in the right parasternal 4th intercostal space, and there was marked epigastric distention, with apparent localization in the left hypochondrium. The physical signs were those of tension pneumothorax and a sterile needle was thrust into the left thorax. He was immediately relieved and breath sounds returned to the lung. It did not seem that he could have lived much longer before we decompressed him. Repeated withdrawals revealed the presence of straw-colored fluid and roentgenograms showed an advanced cavernous pulmonary tuberculosis of the left lung. As his temperature and pulse were rising (104° F., 136), closed surgical drainage was instituted for a mixed empyema. He was improved clinically within a few days, and eventually was subjected to a 11-rib thoracoplasty. The bronchocutaneous sinus closed spontaneously after several months. He has remained as an arrested case for 3½ years.

Case No. 3—(Exogenous trauma). A white woodcutter, aged 34, was received in the emergency room because of a crushing blow to the left chest and hip he received when a tree was felled against him. He was moderately dyspneic and there were classical signs of a left pneumothorax, with the heart displaced approximately 5 cm. to the right. Withdrawals of air relieved him at once and he had to have repeated withdrawals every six hours for 48 hours, then daily for another 48 hours. Roentgenograms revealed fractures of the 4th, 5th, 6th, and 7th left ribs laterally with displacement of the fragments of the 5th rib. He also had a fracture of the pelvis. Conservative treatment was adopted with adhesive strapping, and repeat roentgenograms revealed a satisfactory self-reduction of the projecting fragment of bone. His convalescence was uneventful and the lung re-expanded within three weeks.

Case No. 4—(Carcinoma). A negro female, aged 32, was seen in consultation because of a spontaneous right hemopneumothorax. This diagnosis was verified by one of us and it was noted also that she had had a radical right mastectomy for carcinoma six months previously. There was no pathological study made at that time for lymph node involvement. Examination revealed no evidence of recurrence by palpation in the scar or axillary region, and roentgenograms were of no additional aid in determining the cause of the collapsed lung. Thoracoscopy was advised and revealed multiple pleural plaques which on biopsy revealed grade iii adenocarcinoma. No therapy was advised save frequent withdrawals of the fluid to save the patient from respiratory embarrassment. She succumbed in three weeks.

Case No. 5—(Post-operative complication). A white male, aged 21, was under treatment for a simultaneous left empyema and abscess of the right middle lobe. The previous history was one of upper respiratory infection which did not respond to treatment, but resulted in empyema within a few days. This was drained surgically and his condition improved, only to relapse after seven weeks with the finding of a right pulmonary abscess. Bronchoscopy and transfusions seemed to improve him clinically, but the abscess grew steadily larger and surgical drainage was decided upon. Under local anesthesia the parietal pleura overlying the abscess was exposed with resection of short segements of two ribs. The pleura was packed with gauze due to inefficient symphysis and the wound closed. Suddenly, after 2 hours, he developed marked dyspnea and unconsciousness from which he never recovered, and died after 3 hours. Continuous withdrawal of air from the right pneumothorax and an oxygen tent failed to save him. We attributed his death to cardiovascular collapse due to his prolonged illness.

Exposure of the operative site revealed a spontaneous tear in the pleura, but no projecting rib stump of import.

Case No. 6 — (Endogenous, adhesion). A white seaman, aged 22, was admitted because of a left hemothorax which had occurred aboard ship 6 days previously. He experienced a sharp pain in the left antero-lateral thorax while moving a hawser and noted moderate dyspnea. He was markedly pale. Roentgenograms revealed an effusion of the left thorax extending up to the 4th rib posteriorly. Withdrawals were advised at once, and 1200 c.c. of unclotted blood were removed and 800 c.c. of air replaced. The second day, 1400 c.c. of thinner bloody fluid were removed and 1200 c.c. of air replaced. Repeat roentgenograms revealed now a pneumothorax with little effusion remaining, but the upper lobe was completely atelectatic. Bronchoscopy was performed and revealed a normal tracheobronchial tree. Thoracoscopy was then performed which revealed the site of the intercostal bleeding spontaneously controlled at the 2nd rib posteriorly from a torn adhesion. The lung surface was entirely normal except for the firm collapsed upper lobe. Re-expansion was encouraged by gradual air withdrawals at intervals of five days, and a repeat roentgenogram in 5 weeks showed the whole lung to be re-expanded with an apparently normal upper lobe and some pleural thickening. No transfusion of blood was necessary. We recapitulated the sequence of events to have been a previous lobar pneumonia which had produced the adhesion some years ago.

Case No. 7 — (Endogenous, tuberculosis). This man, a policeman, aged 29, following a tussle with a bandit, was seized rather suddenly with a feeling of pressure and pain in the left chest. When he was first seen by one of us, he had a high fever and signs of a tension pneumothorax. The heart was markedly displaced to the right and he looked as though he might die at any moment. A needle was thrust into the left chest and an unmeasured amount of air removed. The following morning he was re-aspirated. Two more aspirations controlled the situation, but after six weeks he had a recurrence of collapse with the advent of fluid. He eventually returned to work and has been free of trouble for eighteen months. His past history revealed the nature of the pathologic agent. He had had a cavity in the left lung three years ago, which was treated by pneumothorax. Insomuch as adhesions were preventing an effective collapse, a partial closed pneumonolysis was performed with closure of the cavity in four months. It was evident that a remaining adhesion had caused his spontaneous collapse with tension. It is noteworthy that this patient escaped a pyopneumothorax which would have resulted had the tear occurred into the cavity-bearing area.

Conclusions

1. Spontaneous pneumothorax may arise from exogenous or endogenous causes. Exogenous causes include those cases referable to trauma; endogenous causes are those seen in disease, as, tuberculosis, malignancy, cystic disease, and non-specific inflammations of the lung.

2. One must be prepared to recognize pneumothorax on sight by its physical signs. Tension pneumothorax may be rapidly fatal.

3. Prompt relief of the pneumothorax by aspiration is indicated. The presence of fluid modifies the rate of aspiration particularly if accompanied by blood.

4. The pathological significance of spontaneous pneumothorax is discussed, with particular reference to its etiologic agent.

5. After-treatment is most important in prevention of recurrence.

6. A series of seven illustrative cases is presented to exemplify certain phases of etiology and treatment.

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THE ROLE OF SPLENECTOMY IN DISORDERS OF THE SPLEEN

REPORT OF A SERIES OF THIRTY-THREE COLLECTED CASES

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HOUSTON, TEXAS BEAUMONT, TEXAS

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SPLENECTOMY was first performed by Fioravanti in 1549, and the first substantial series of cases (fifty-three) was reported by Adelmann in 1887. During this era, wounds, abscesses, cysts, torsion of the pedicle, and enlargement due to malaria made up the list of disorders for which the organ was removed. Today, the aforementioned causes are of infrequent importance, and certain blood dyscrasias now lead the list of indications for splenectomy. These blood disturbances are collectively designated as the splenic anemias. Those which will command our attention are (1) chronic hemolytic anemia, (2) Banti's disease, (3) idiopathic purpura hemorrhagica, and (4) Gaucher's disease. Their progress leads to one or both of the following complications which may frequently overshadow the splenomegaly in the symptoms and signs they exhibit: (1) liver damage with jaundice and ascites; and (2) a chronic anemia which is either hemorrhagic or hemolytic in origin. The spleen is also removed for rupture of the organ and enlargement due to tumors, cysts, and, at times, syphilis and malaria.

Chronic hemolytic anemia was first described by Minkowski in 1900. Splenectomy produces dramatic results in this condition. The diagnosis rests on increased fragility of the red blood cells, reticulocytosis, increased excretion of urobilinogen in the urine, and icterus. Curiously enough, 60 per cent of these patients have gallstones. The anemia is progressive, but then is followed by disappearance of both jaundice and anemia, although the microcytosis and fragility of the cells remain. Frequently after splenectomy, the platelets rise to unusual heights and there is danger of mesenteric or portal thrombosis with high fever, abdominal pain, and convulsions. This may subside spontaneously after a few days when the platelet count returns to normal. If severe, deep Roentgen therapy should be applied before thrombosis appears.

Banti's disease is characterized by a progressive anemia with splenomegaly, leucopenia and thrombocytopenia. This same triad may be produced by certain acute and chronic infections, hemolytic anemia, Cooley's disease, leucemia, hepatic cirrhosis, and lymphoblastoma, and must be ruled out. As the disease progresses, hepatic cirrhosis with jaundice and ascites appears. Gastric and esophageal hemorrhages are quite common due to the subsequent engorgement of blood in the portal circulation. The prognosis depends then upon the amount of cirrhosis found at operation. Even in the late stages of the disease, splenectomy is quite justified on two scores: (1) the amount of blood in the portal circulation is reduced some 20 to 25 per cent, exerting a reduction of load on the scarred liver, and (2) the reduction of portal congestion obviates frequent gastrointestinal hemorrhages and resultant anemia. The liver in these cases has marked regenerative power. If the ascites is marked, one may perform an omentopexy in addition; and for repeated esophageal hemorrhage, coronary ligation is of definite value. If we are to accept Brandenburg's and Eppinger's conception that Banti's disease is not a separate clinical entity but merely a splenomegalic form of hepatic cirrhosis, we turn to the fact that W. J. Mayo performed splenectomy in some nineteen cases of true primary cirrhosis in

the last stages of the disease with good results. Present day management of cirrhosis permits more flexible medical treatment, while the ascites is handled surgically. The risk of splenectomy in Banti's may be somewhat greater than in the other splenomegalies due to the intimate nature of adhesions between the spleen and the diaphragm.

We caution against the advocation of splenectomy in another disease entity which resembles Banti's. This is a splenomegaly with gastric hemorrhage but the splenic enlargement follows the hemorrhage within a day or two. These patients exhibit a portal thrombophlebitis quite commonly, and the spleen is thought to enlarge due to the stasis. Omentopexy and coronary ligation may be of considerable aid, but splenectomy gives deplorable results.

In purpura hemorrhagica idiopathica we have a comparatively rare disease, although symptomatic purpura is common, particularly in children. This disease was first described by Werlhof in 1735. About 80 per cent of those afflicted are females who have prolonged menses. There is a secondary anemia with a reduction of platelets. Subcutaneous and gastrointestinal hemorrhages are common; there is a prolonged bleeding time, delayed clot retractility, positive tourniquet test, and a normal coagulation time. Medical treatment is advisable in the acute phase of the disease as remissions are quite common. The only reluctance in delaying splenectomy is the frequency of intracranial hemorrhages following trivial trauma in these youngsters, when removal of the organ might have afforded a cure. After removal of the spleen the platelets rise to normal within the first week or so but do not remain there; however, hemorrhages are never so common or so severe as before splenectomy. Whipple reported seven deaths in eight operations performed during the acute phase, while there were only six deaths in seventy-three cases operated on during the chronic stage.

In Gaucher's disease we have a familial entity characterized by hemochromatosis, hypochromic anemia, leucopenia, thrombocytopenia and a later osteomalacia of bones with pathologic fractures. The spleen enlarges to great dimensions and there is deposition of kerasin in the whole reticuloendothelial system. Biopsy of the spleen or bone marrow reveals a characteristic lipoid laden pulp. Splenectomy is performed for symptoms produced by its enlargement, viz., pressure symptoms, severe anemia, or retardation of growth of the child.

Tumors and cysts of the spleen are relatively uncommon. Splenectomy is performed when exploration reveals their identity. One must remember that polycystic disease of the spleen may be associated with polycystic disease elsewhere.

Trauma is again becoming more important with the increase in auto accidents. Intraperitoneal hemorrhage with the history of a blow over the spleen should render suspicion of a rupture of the viscus. Splenectomy should be performed within the first twenty-four hours, as expectant treatment during this interval produces a 90 per cent mortality.

We have collected a series of thirty-three splenectomies performed in southeast Texas during the last ten years. In this group two were removed for hemolytic anemia with no deaths; ten for Banti's disease with three deaths; eight for purpura with four deaths; two for malaria with one death; three for leucemia with three deaths; one for lymphosarcoma of the spleen, and one incidentally to facilitate removal of a carcinoma of the stomach; and six for rupture of the spleen, with three deaths. (Table 1.) One patient with Banti's disease lived eight months, then succumbed from hepatic cirrhosis. One of the authors' cases of Banti's with grade 4 cirrhosis who was subjected to splenectomy with amentopexy has an apparent cure after four years. Another of our personal cases of Banti's gave a dramatic response to splenectomy and coronary ligation after multiple severe esophageal hemorrhages. We no longer

advocate removal of the spleen in the leucemias, as in doing so we would be removing the burial ground for the white cells which are already abnormally high.

TABLE I

Splenectomies	No.	Died
Chronic hemolytic anemia	2	0
Banti's disease	10	3
Purpura, idiopathic	8	4
Malaria	2	1
Ruptured spleen	6	3
Leucemia	3	3
Lymphosarcoma	1	0
Incidental to gastric resection	1	0
Total	33	14 (42.4%)

The total operative mortality of this group was 42.4 per cent which we think much too high. Splenectomy should carry a surgical risk of less than 10 per cent even in far advanced lesions.

CONCLUSIONS

1. Splenectomy is indicated in the treatment of the various splenic anemias, for trauma, cysts, tumors, abscesses, torsion of the pedicle, and at times in syphilis and malaria.

2. Omentopexy and coronary ligation are to be performed in addition to splenectomy for the complications of the splenic anemias, viz., ascites and gastrointestinal hemorrhage.

3. A series of thirty-three collected cases is reported herein, exemplifying the indications for splenectomy. The combined operative mortality was 42.4 per cent.

4. The surgical risk of splenectomy even in late stages of disease should be less than 10 per cent.

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PHARYNGOESOPHAGEAL DIVERTICULUM

REPORT OF TWO PATIENTS TREATED SUCCESSFULLY BY A ONE-STAGE PROCEDURE

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MANY patients with pharyngoesophageal diverticula have been operated upon since the first successful case reported by Von Bergmann in 1892. While the condition is a relatively uncommon one, there have been in recent years many comprehensive reports in this country by Judd, Lahey, and Babcock and by Moynihan, Billet, Diez, Gerlings and Godard abroad. Herniations of the mucosa and submucosa represent a type of pulsion diverticulum. They differ from the traction type in that the latter contains all layers of the wall including the muscular layer. The traction type is more prevalent at the root of the lung where scar tissue from peribronchial lymph nodes exerts a pull on the coats of the esophagus. These traction diverticula rarely require surgical intervention. The pulsion type is usually found at the pharyngoesophageal junction posteriorly, where there is frequently a congenital weakness of the diagonal fibers of the inferior constrictor muscle of the pharynx as it meets the circular muscle of the esophagus. Most of these diverticula invariably present themselves toward the left side of the neck due to the proximity of the esophagus to that side at that level.

Pulsion diverticula may be relatively small but at times they reach considerable size. As their size increases, they gravitate along the vertebrae into the upper mediastinum between the pretracheal and prevertebral layers of fascia. They occur about four times more frequently in men than in women; moreover, they do not seem to attain similar magnitude in women as in men. They are rarely ever seen before the age of fifty although the history often suggests that they have been present for a considerable length of time.

Usually the patient does not seek surgical relief until a great deal of difficulty has been experienced in swallowing. Other symptoms as regurgitation of food, gurgling noises, or even choking spells may be prominent. The larger diverticula usually lead to inanition and dehydration since the enlarging sac encroaches upon the normal lumen of the esophagus causing distortion of the latter passage. This fact can be appreciated by those who have examined these individuals endoscopically in whom it becomes almost impossible to follow the esophageal lumen even under direct vision. We call attention here to the dangers of bougienage for diagnostic purposes and reserve this procedure for those cases which require it as a postoperative maneuver. Even here, perforation and resultant mediastinitis have been reported. We believe it advisable to have the patient swallow one end of a long silk thread some days before esophagoscopy. This string also facilitates introduction of a stomach tube for feeding purposes pre- or postoperatively.

There are many advocates of a routine two-stage operation but we are impressed with a like number of one-stage operators who have never had mediastinitis as a complication. After reviewing the results of

those with greatest experience, we have concurred with the opinions of Judd and Harrington who reserve the two-stage procedure for those cases: (1) in which diverticula are large, (2) in which considerable inflammatory reaction is found at operation on exposing the sac, (3) in which the patient does not represent a good surgical risk, and (4) in which the sac extends into the mediastinum.

FIG. 1. An oblique view of the partially filled diverticulum.

FIG. 2. Lateral view of the diverticulum. Note compression of the esophagus.

In the two-stage procedure the sac is dissected from its bed and is brought up to the skin and sutured to the sternomastoid muscle as a first stage. About a week or ten days later when the tissues of the neck have become sealed off and ligation of the neck of the sac and its removal are carried out, there is very little danger from cellulitis and mediastinitis. However, in certain instances in which operation upon the neck has been carried out before, the planes of the neck are already sealed off by scar tissue; consequently, this danger is eliminated.

In the individual in whom the diverticulum is small and the condition good, the operation can be carried out safely in a one-stage procedure. This has many advantages over the multiple-stage operation. First, hospitalization is shorter; second, recurrence and fistula formation are rare. Better visualization of the structures about the neck of the sac is provided when there is no scar from a previous stage. This permits a closer amputation of the sac and a better closure of the stump. Third, there is less danger of injury to the recurrent laryngeal nerve. Fourth, secondary bougienage is seldom necessary due to minimal distortion and spasm of the pharynx produced. Lastly, the so-called choking spells from trapping of air in a distorted anchored sac of a two-stage operation are eliminated. In cases in which fistulae have occurred following either procedure, these have usually closed spontaneously without difficulty.

Cervical block anesthesia is preferred, for the patient is able to swallow at all times; and if any fluid should be expressed from the sac, it would not be likely to get into the trachea. Cases of pulmonary abscess have been reported in which general anesthesia was used. Moreover, patients are always instructed to empty the sac before going to the operating room.

The operation consists of an incision about four inches long, anterior to, but parallel with the sternomastoid muscle.

In the two cases reported, the hospital time was materially cut down, and the patients made uneventful recoveries. There was a slight drainage of liquid food particles through the incision for a few days after the nasal tube was removed, which was done on the sixth postoperative day. It is advisable to leave the silk string down the esophagus into the stomach in case a change of nasal tube has to be done at any time, or if esophageal dilatations become necessary. The patient received nourishment through the nasal tube for the first week after the operation. By this procedure, tension on the esophagus is kept as slight as possible and healing proceeds rather rapidly.

Fig. 3. Lateral view of the filled diverticulum.

Fig. 4. Anterioposterior view of the diverticulum.

Dissection is carried down to the omohyoid muscle; this is divided. The carotid sheath is retracted laterally and the thyroid gland medially. The diverticulum will be found coming off from the posterior wall of the pharynx and can easily be identified by its lighter color; ordinarily there is a small plexus of veins over it. Getting the patient to talk or blow will also facilitate in locating the sac. As little circulation as possible is interfered with because of the inadequate blood supply to the structures. After the sac is freed up it is brought out through the upper angle of the incision, if it is of sufficient length; if not, it is stitched to the structures of the neck and can later be identified by leaving a silk thread sutured to the sac, if there is to be a two-stage procedure. If it is to be removed in one stage, the neck of the sac is ligated and then removed, a second row of inverting Lembert sutures being applied to the stump.

Since so many of these patients are in the older group, we feel that it is advisable to let them get up on the day following operation. This will allow them to take care of themselves, particularly in regard to bladder elimination. The risk of the operation is very low when this plan is carried out. Following the operation the patient is able

to swallow normally, and usually begins almost immediately to put on weight.

Case I. Male, age fifty-five, had had trouble in swallowing for four or five years. He had been operated upon three times before, but recurrence followed promptly after each operation. On September 12, 1937, the patient was reoperated upon. The sac was found at its usual location. It was completely dissected and removed. The opening in the esophagus was closed by an inner row of silk. There was some drainage from the esophagus a few days after the operation but the fistula promptly closed. Since that time the patient has gained weight, has been perfectly well, without any difficulty in swallowing.

Case II. Female, age fifty-one, had had trouble in swallowing for three or four years. *X*-ray revealed pharyngoesophageal diverticulum. On June 17, 1939, the diverticulum was excised by a one-stage procedure. There was a slight liquid drainage from the esophagus about one week after operation. The patient had an uneventful convalescence. She has gained weight and has had no further difficulty with swallowing. Esophagoscopic examination reveals no stricture and there is no evidence of remaining diverticulum opening.

SUMMARY

We have presented two cases in which the one-stage procedure has been used in the treatment of pharyngoesophageal diverticulum. If the patient is in good condition and the sac is not too large, we believe that this procedure can be carried out. If there is any doubt as to the one- or two-stage procedure, we believe that the two-stage procedure should be used because there is less danger of mediastinal infection. The ultimate result should be obtained whether the one- or two-stage procedure is used. The one-stage procedure minimizes the amount of time, but time should never be considered if there is any question as to the safety of the patient.

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TOTAL HYSTERECTOMY

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TOTAL HYSTERECTOMY

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THE advance of surgical pelvic technic in abdominal hysterectomies has changed the ratio of subtotal to total operations considerably in recent years. In former times subtotal hysterectomy was generally chosen for all benign conditions necessitating an operation, and the total form of surgical treatment was applied exclusively in malignant cases. Complete hysterectomy is performed also for benign disturbances of the uterus, and is gaining lately more and more ground in the treatment of benign conditions of the uterus. The pioneer work was done in large institutions as University, State and County hospitals, where diagnosis indicating operation was under direction of a closed staff utilizing strict principles. In the larger private institutions, where a great number of surgeons do their work according to their own ideas and principles, differentiating substantially from each other, the switch toward total hysterectomy has not reached the right acceptance which it should have.

Nelson and Weisberg in a collected series of cases from the literature combined with their own series summing up 14,591 hysterectomies in all, have reported the ratio of total to subtotal operations as approximately 1:2. This ratio is to be considered recommendable. But in private hospitals the ratio is till 1:4, 1:5 and even 1:6. A ratio in which total hysterectomy is performed more frequently than subtotal, with excellent end results, is reported by Harris and by Masson. The attitude toward total hysterectomy amongst various authors varies still to a great extent as can be seen in Table 1 collected from the recent literature.

The difference in the mortality rate between one form and the other is almost negligible, as evident from this table and other reports, but only as long as the operation is performed by an expert hand. The untrained and unexperienced will, of course, have a considerably higher mortality in total hysterectomies. Nelson and Weisberg observed that the greater the number of total hysterectomies done in any one series, the lower the mortality. In other words skill is the most important factor in the performance of total hysterectomy.

TABLE 1
ABDOMINAL HYSTERECTOMIES

Authors	Abdominal Hysterectomies	Subtotal	Mortality, Per Cent	Total	Mortality Per Cent
Nelson and Weisberg	14,591	9,606	3	4,985	3.56
Tyrone	453	316	1.9	137	2.2
Harris	1,145	314	0.6	831	0.6
Masson	2,542	766	0.9	1,776	1.2
Phillips and Sears	173	141	1.41	32	0

TABLE II

	Number and Per Cent	Average Age in Years	Morbidity (Days in Hospital)	Mortality, Per Cent
Subtotal	141 (73.82)	38.0	13.1	1.41
Total	32 (16.75)	41.7	12.5	0
Vaginal	18 (9.43)	56.6	13.2	0
Summary	191	40.6	13.1	1.05

In our own series of 191 consecutive hysterectomies performed by different surgeons of the active and courtesy staff at St. Joseph's Infirmary, Houston, we had as Table II shows, 141 subtotal (73.82 per cent), thirty-two total (16.75 per cent) and eighteen vaginal (9.43 per cent) hysterectomies. Without any doubt, the number of total hysterectomies is far below the desirable percentage. But St. Joseph's Infirmary is a foremost private institution, where the indication of one type of opera-

tion or the other is determined individually by every surgeon without commonly outlined principles and with a widely varying background as far as training is concerned.

The average age for all hysterectomies was 40.6 years, for subtotal 38.0, for total 41.7 and for vaginal 56.6 years. The stay in the hospital until discharge was on an average of 13.1 days. There was no marked difference of morbidity between one form and the other; the morbidity in total hysterectomies was even slightly lower. However, it must be mentioned that such an estimation of morbidity is incorrect, as the difference of the financial status of different patients changes not inconsiderably the surgeon's advice, at least as to the minimum stay in the hospital. Out of 191 operations we had two deaths (1.05 per cent), both after subtotal hysterectomy which brought the mortality of the latter up to 1.41 per cent. The thirty-two total and eighteen vaginal hysterectomies were without fatality.

The attitude toward total and subtotal hysterectomy is still in many points controversial. Many physicians are hesitating to perform a complete hysterectomy because of higher risk, increased shock, higher mortality and higher morbidity, as they claim. But statistics of competent surgeons eliminate these fears, because they show clearly that the morbidity in total hysterectomies is not increased, often decreased, and that the end results are by far better.

If the only purpose of total hysterectomy would be to avoid the possibility of later developing cancer in the stump, as advocated by Jones, the utilization of this operation would be greatly limited, because the incidence of cancer in the stump after subtotal hysterectomy in benign cases is only about 1 to 2 per cent. But we all see patients coming back after subtotal hysterectomy stating the operation gave them only temporary or partial improvement. They complain of arthritic and myositic disturbances, and upon examination we find a well developed cervicitis with leukorrhea, which eventually makes a later surgical intervention necessary. Many of these patients change their doctor because they think the first operation was not successful, therefore making it an impossibility to follow up the postoperative results. If a perfect follow-up after subtotal hysterectomy were possible, we are inclined to believe that the incidence of unsatisfactory end results would be much greater.

Often surgeons will not perform a total hysterectomy, because they believe in opening the vagina the danger of infection is increased. We agree with Masson, who states that by applying a meticulous technic including surgical preparation of the vagina the danger of infection is less, because "in subtotal hysterectomy the cervical glands are cut across and often transversed by sutures," thus forming a focus of infection if the cervix was previously inflamed. Also cauterization and conization of the cervix cannot prevent infection as "those procedures leave a sloughing region continuous with the operative field and peritoneum." Tyrone's opinion in regard to this is as follows: "We are now performing the complete operation more often, not only because of the danger of malignancy in the remaining stump, but because a diseased cervix produces definite and annoying symptoms, whether the uterus is in or out of the patient." We, ourselves, might add that we do not know what purpose a cervix serves without the body, especially in women near or at menopause. Richardson reported that in follow-up examinations of women who have borne one child or more, unsatisfactory conditions of the cervix or the lower birth canal were found in 50 to 75 per cent. Why then preserve a cervix, unless for some important reason?

The objection that following total hysterectomy, sortening of the vagina, diminished secretion of the vaginal mucosa, and prolapse of the vaginal vault—all causes of dyspareunia—do not infrequently occur, is not tenable if the proper technic is employed. Experienced operators, who

did total hysterectomies on a large scale deny these occurrences so well as injuries to ureters, bladder and bowels; the latter occur in unexperienced hands, also in subtotal operations. Furthermore, if the surgeon possesses the necessary skill, the slightly greater technical difficulty of the total operation should be no hindrance to the performer. Only in very obese women and in patients who have an unusually deep pelvis do we encounter some difficulties.

Also the time factor is not a sufficient argument to reject complete hysterectomy, because the duration of the operation is usually estimated to be prolonged from three to ten minutes (three more minutes according to Nelson and Weisberg; five to seven more minutes, according to Tyrone).

Therefore, we would advise total hysterectomy in the following cases: (1) In women who had one or more children by vaginal delivery, requiring hysterectomy for conditions of the corpus uteri; (2) in women near or at the menopause with uterine pathology requiring hysterectomy; (3) in all cases necessitating operation for conditions of the uterine body, in which the cervix is also diseased: (a) lacerations, (b) inflammation (cervicitis), (c) benign cervical tumors (polyps, cysts, etc.); (4) in all malignant cases.

For the advisability of subtotal hysterectomy we like to quote Richardson who considers the following cases as suitable for this operation: (1) Women requiring hysterectomy for benign conditions, who possess perfectly normal cervices (mostly young women and nullipara); (2) instances in which the operative hazard compels the execution of conservative surgery; (3) cases in which for good and sufficient reasons it is of paramount importance to preserve menstrual function; (4) most cases requiring hysterectomy during pregnancy.

A word might be said about the adverses. Usually in performing a total hysterectomy we also remove both tubes. In that way the toilet and peritonization are greatly facilitated. There is less likelihood of pelvic inflammation; the blood supply to the ovary is improved since there is not the increased strain of nourishing the tube. However, we try by all means to preserve one or at least a part of the ovary corresponding to the pathological involvement of the ovaries whether the woman has passed menopause or not, as long as complete atrophy of the ovaries has not taken place. Caution should be observed not to fix the ovary to the vaginal vault because this often causes dyspareunia, but instead to bury it between the folds of the broad ligament.

We usually make use of Masson's technic for complete hysterectomy, and this with good results. Here we can only briefly emphasize the most important steps of the operation. The operation is performed in the same way as for subtotal hysterectomy, only that in addition the bladder is freed way down from the cervix and the vaginal vault. The cervix should be enucleated from the vaginal vault. As soon as the vagina is opened and the cervix enucleated, we insert an iodine sponge which is removed after the operation. The vaginal vault is closed with a continuous mattress suture in two rows rolling the cut edges of the mucosa into the vaginal canal. Then the peritoneum and the uterosacral ligaments are brought upward and placed over the vaginal vault. After that the round ligaments are approximated and overlapped and secured to the vaginal vault, to the tissues in the base of the broad ligament, to the stumps of the uterine vessels and to the uterosacral ligaments. Peritonization of the raw surfaces completes the operation. No drains are used. Employing this technic, an injury to the ureters, bladder and bowels as well as shortening of the vagina can be relatively easily avoided.

Concluding, we believe that with proper technic the risk of total hysterectomy is not much greater than in subtotal hysterectomy. The satisfactory end results should make this operation much more popular than it actually is at the present time.

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RIGHT TRAUMATIC DIAPHRAGMATIC HERNIA

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RIGHT TRAUMATIC DIAPHRAGMATIC HERNIA

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HERNIATION of the abdominal viscera into the right hemothorax is unusual. This case represents very many interesting things:

The patient was a white male, age 35, who had had an automobile accident eleven years before. At that time he had suffered a fracture of his spine and had a laceration of his diaphragm, but he had recovered from this serious accident and had carried on fairly satisfactorily for a period of eleven years. Recently, however, there have been attacks of abdominal pain, crampy in nature, associated with nausea and vomiting which led one to believe that he probably had an intermittent intestinal obstruction. He had known that he had had a diaphragmatic hernia on the right side since the time of his injury.

X-rays revealed a separation of the diaphragm from the anterior chest wall through which protruded the ascending colon, stomach, cecum, appendix and loops of ileum. His general condition was quite normal. Operation was advised and because of the anterior location of the rent in the diaphragm, an anterior abdominal approach was decided upon. Under intratracheal anesthesia a high right rectus incision was made, and it was found that the right leaf of the diaphragm had been torn from the chest wall, starting at the xiphoid and extending well around to the mid-axillary line. The diaphragm just dropped posteriorly.

FIG. 1. Numerous loops of small intestine are seen in the right lower chest cavity. The outline of the diaphragm is not visualized.

FIG. 3. Shows the lung completely re-expanded on the thirty-sixth postoperative day. Outline of the diaphragm was well visualized.

FIG. 2. Barium filled colon shows the entire right colon and most of the transverse colon with loops of small intestine extending into the right hemothorax.

Through this opening the transverse colon, ascending colon, ileum and stomach herniated into the chest cavity as high as the apex of the chest. The lung was about two-thirds compressed. The round ligament and falciform ligament of the liver had been completely torn, so that the left lobe of the liver was lying in the right lower quadrant, the liver having rotated into this position. When the liver dropped down, of course, this enabled the other abdominal viscera to get through the opening readily in the diaphragm. The abdominal viscera could readily be replaced in the abdominal cavity with the exception of the duodenum, which was adhered along the mediastinum. This was separated and replaced. The diaphragm was then resutured to the anterior chest wall, using catgut and fascia lata stitches.

Fig. 4. The thirty-sixth postoperative day shows the barium filled colon and stomach well below the diaphragm.

The liver was replaced in its normal position and sutured up over the rent to act as a buffer. The falciform and round ligaments were reconstructed. The procedure worked out very well. The abdomen and chest were closed without drainage.

The patient stood the operation well and had, with the exception of an accumulation of some fluid under the skin flap, almost an uneventful convalescence. *X*-ray of his chest and abdominal viscera three weeks after operation revealed the viscera to be in normal relation in

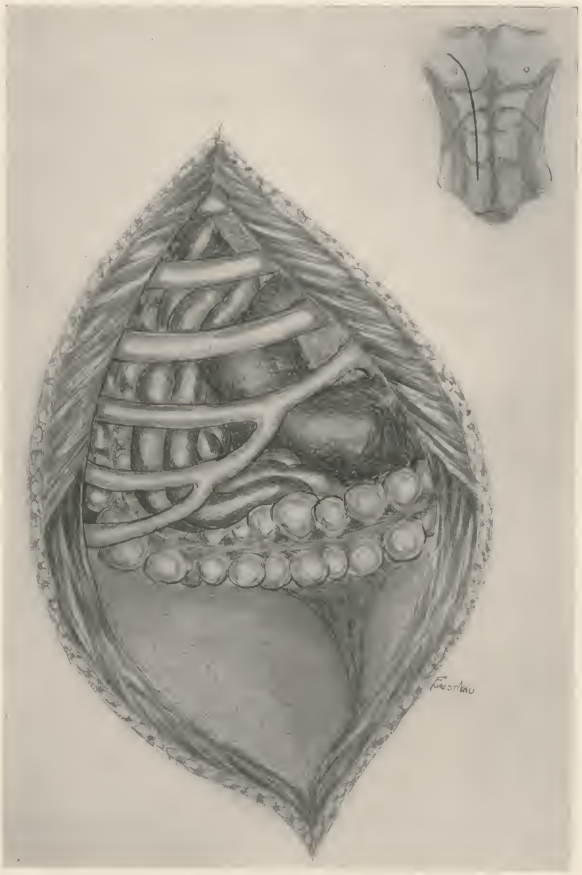

Fig. 5. The type of incision utilized and the position of the abdominal viscera in the right chest cavity.

the abdomen. He is eating well and his general condition is excellent.

This is the second traumatic diaphragmatic rupture that I have repaired within the year. The other occurred on the left side, and was a laceration of the dome, through which the spleen, transverse colon and loops of small bowel were herniated into the left chest cavity. This laceration was repaired by transcostal approach, suturing the diaphragm from above.

Each case is an individual one and the type of incision for exposure will depend upon the location.

Fig. 6. The method of suture of the diaphragm to the chest wall by through-and-through suture is shown.

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When Should a Tumor Be Considered Inoperable

JOHN ROBERTS PHILLIPS, M.D.

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When Should a Tumor Be Considered Inoperable

JOHN ROBERTS PHILLIPS, M. D.

In dealing with malignancy, the problem of inoperability is always coming up, both before operation and at the time of exploration. There are those surgeons who will make every effort to remove a malignant lesion, even though the condition, by some, may be considered as beyond removability. Oftentimes it is largely a question of one's experience and ability. In dealing with intra-abdominal malignancy, one should be certain, as far as possible, that there are no evidences of irremovable distant metastasis, which precludes curability. Metastasis in the neck, in the chest, around the umbilicus and on the rectal shelf should always be excluded. If these areas of distant metastasis can be excluded, then, for the most part, all intra-abdominal malignancies should be explored, for oftentimes x-ray is not conclusive in the extent to which the process might have developed. sometimes there is an associated inflammation, which might lead one to believe, from an x-ray standpoint, that the lesion is inoperable, and yet at exploration it may be found to be rather easily and completely removed.

In the case of carcinoma of the stomach in high-lying lesions, total gastrectomy is now being carried out frequently with a high degree of success from a mortality standpoint. Occasionally, in lesions of the stomach, purely palliative procedures may be indicated. For example, if the patient has an ulcerating lesion of the pyloric end of the stomach with obstruction and has a metastatic nodule in the liver, which is questionable, or even certain, this patient may be afforded a period of relief from his obstruction if the lesion is exluded, or if the lesion—if removable—is removed. Removal of a lesion precludes further obstruction, bleeding or perforation, and the last short time of the patient's life might be lived in relative comfort.

In lesions of the colon in which the degree of malignancy is usually low, we are justified in carrying out extensive procedures, even though they seem to be only palliative in nature.

In carcinoma of the sigmoid in which the abdominal wall is involved by perforation, the local area can be excised, or even if the bladder should be involved, a portion of the bladder can be removed and the patient can be afforded considerable palliation oftentimes and sometimes, surprisingly enough, they are given an apparent cure. This is well borne out by an illustrated case.

CASE 1.

Patient was a white male, age 33. He presented himself for examination on August 18th, 1940, stating that he had noticed a lump in the left side of the abdomen for three months. He had been constipated, but had passed no blood or mucus. Constipation had become progressively worse, and he had lost twelve pounds in weight. His general condition, otherwise, was good. At exploration a perforated carcinoma of the sigmoid was found. The liver and mesenteric glands were negative. The carcinoma had perforated onto the abdominal wall, so it was necessary to remove a portion of the abdominal wall with the growth. Ten inches of the sigmoid was removed over a Rankin Clamp, using the obstructive type of resection and a catheter stitched into the proximal loop for passage of gas. The patient had an uneventful convalescence. The pathological specimen revealed it to be an adeno-carcinoma, grade 4. The size of the lesion was 3½ x 3½ x 3 centimeters. There were no demonstrable glands involved. On October 8th, 1940 his colostomy was closed. He made an uneventful convalescence from this procedure and since that time has enjoyed perfectly normal health. He has been back to his usual work, and there has been no evidence of recurrence. A period of over two years has elapsed after what seemed to be a hopeless malignancy involving the sigmoid was removed. Certainly the procedure has been well justified in his case, as he still is quite normal.

Also in cases of malignancy of the colon, if there should be a solitary metastatic lesion in the liver, a palliative resection can be carried out and the patient will be spared the suffering and discomfort of obstruction, together with the severe pain which comes late from involvement of pelvic nerves.

The size of a tumor should never defer one from abdominal exploration. This, oftentimes, I feel does scare off some surgeons, and patients are not afforded a chance of relief purely on this basis. Large tumors of the malignant type often are slow-growing, and that is the reason the patient has been able to survive for such a length of time, and it is not at all uncommon that in the removal of large lesions, the patient will be afforded a period of palliation at least, and oftentimes cure. This is well borne out by the fact of an illustrated case.

CASE 2.

This patient was a white male, age 43. He presented himself for examination on April 28th, 1942. He had a large lower abdominal tumor which felt cystic. It was not entirely fixed. It filled the entire lower abdomen. He had been explored in November, 1941 elsewhere and biopsy of the tumor made, which proved it to be sarcoma. The lesion, at that time, was considered inoperable. He was given large doses of x-ray treatment, but the tumor continued to progress in size. Due to the fact that his general condition was good I felt that he should be re-explored, which was done on May 4th, 1942. Exploration revealed a large, degenerating sarcoma arising from the retroperitoneal tissues. There was a loop of small intestine adhered into the malignant process so that this loop of small intestine had to be resected. The tumor was removed. There was a questionable nodule in the depth of the liver. It could not be visualized, consequently, it was not certain as to whether it was a malignant invasion or not. The removed specimen proved it to be a spindle cell sarcoma of a moderate degree of malignancy. The patient had a rather stormy convalescence for the first week, due to the fact that a rather extensive procedure had to be carried out. After that his convalescence was quite normal. When he returned to the office for examination five months later he had gained twenty-two pounds in weight, looked perfectly normal and his abdominal examination was entirely negative. He was feeling fine, and although the outlook is uncertain, we feel that this rather extensive procedure was justified in light of the definite improvement in his condition.

One has to have a good deal of self-confidence and weigh the facts very thoroughly before re-exploring a patient who has been explored by another surgeon. Yet, not uncommonly, upon re-exploration tumors which had been pronounced inoperable are found to be removable. Before this is done a very thorough talk and discussion of the case, if possible, should be carried out with the surgeon who had done the exploration previously. It takes a good deal of courage to go ahead and advise exploration on one who has been explored previously—particularly if one or two doctors have shaken their head and wondered if such a thing is justifiable. I have, on occasion, done this with some reluctance, but have occasionally been able to remove a tumor which has been previously labeled as "Inoperable."

Sometimes one is puzzled as to whether to explore an abdominal tumor, particularly when there has been evidence of carcinoma elsewhere, as in the breast—particularly if there is still evidence of malignancy lingering in that area. One always wonders what to expect in the future of such a case. The following case very clearly illustrates the importance of not giving up hope in cases of multiple malignancy, for oftentimes these patients can be carried for a considerable length of time, as shown by this patient, who has lived now for more than eight years, following radical amputation of the breast, and for the last six years we felt that fatality could be expected at any time.

CASE 3.

This patient presented herself to me first on July 24th, 1934. At that time she was 39 years of age. She had a lump in the right breast, which had been present for two years. The nature of the lump was not conclusive, but upon its removal it proved to be an adeno-carcinoma, grade 4, and the glands in the axilla and the supraclavicular glands proved to be involved. A radical amputation was done, removing the pectoralis minor and the greater portion of the pectoralis major muscles, with a complete glandular dissection. The patient had an uneventful convalescence, but within a year, came back with evidence of skin metastasis. These were treated by x-ray radiation and also later by radium. An April 26th, 1937 she presented herself with a tumor in the left breast, and upon removal it proved to be grade 4 adeno-carcinoma with glandular involvement. A radical amputation of this breast was done, removing the pectoralis minor and the greater portion of the pectoralis major muscles, doing a complete glandular dissection of the axilla. The patient made an uneventful convalescence and since that time almost at no time has the skin on the chest wall been entirely free of metastatic implants; however, these have been fairly well controlled by radium treatment. Her general condition has remained good and she has been able to take care of her usual household duties. At no time has there been any evidence of metastasis to the lungs. In April of 1942—approximately eight years after the first primary carcinoma of the breast was removed—she presented herself with ascites and bi-lateral ovarian tumors. She was quite anemic and her general condition was only fair. The question immediately came up as to whether these were primary tumors or whether they were secondary from the breast malignancy. Due to the fact that this lady had lived so long from radical

operation of the breasts, I felt justified in exploring her abdomen, which was done on April 14th, 1942. There was no evidence of any malignancy in the stomach. The liver was normal. Both ovaries presented themselves, with solid carcinoma. There was a considerable amount of free fluid in the abdominal cavity. A bi-lateral salpingo-oophorectomy and a subtotal hysterectomy was done. The patient was able to leave the hospital within a week Following that she has had x-ray radiation over the pelvic organs and at this time shows very definite evidence of metastasis to bones. However, there is no evidence of metastasis to the lungs. We feel certain that this represents a case of true Krukenberg tumor from carcinoma of the breast, in light of the fact that examination of the stomach, gall-bladder and small bowel was negative at the time of the removal of the ovarian tumors and due to the fact that there is definite evidence now of metastasis in the bones. This represents a most remarkable case and for the patient to have survived eight years and had two subsequent malignant processes, she, at this time, is still quite ambulatory and active in her duties even though she has bone metastasis.

I realize that I am talking about some pretty delicate things and that I certainly don't want to have anybody gain the impression that I would advise removal of inoperable lesions, but certainly one is encouraged to be as understanding as possible for we are rewarded oftentimes by these encouraging cases, which does encourage us to tackle some of these problems in which otherwise the patient's doom would be sealed.

I feel that all cases of intra-abdominal carcinoma in which evidence of incurability cannot be proven by examination, should be explored providing the general condition of the patient is such that an exploration with the necessary removal can be expected. Palliative resection has a very definite place in the relief of a patient from the suffering which is attended from malignancy, if it is at all possible, and if one can assume that the period of relief will justify the procedure. Six months or a year, I think, is a fair time to suppose that a patient might get relief by palliative procedure. I do not believe that the presence of irremovable metastatic glands, provided the local growth is removable, is contra-indication to resection, for the glands may even recede after resection of the primary growth. Oftentimes they are inflammatory and we occasionally see cases in which apparently the metastatic glands completely disappear. There are two theories for this. One is that the secondary growths are dependent upon the primary growths for their existence, and the other is that following removal of a primary growth the general condition of the patient frequently improves sufficiently so that the secondary growths are either killed off or retarded in their progress. Solitary metastasis in the liver, particularly if the lesion is primary in the colon, should not preclude removal of the primary lesion.

PRESACRAL NEURECTOMY

BY

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HOUSTON, TEXAS

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Copied by L.E.Stone

PRESACRAL NEURECTOMY

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In the development of surgery of the sympathetic nervious system, presacral nerve resection has been outstanding in the short time we have known it. Although Jaboulay first relieved pelvi pain in 1899 by division of the sympathetic fibres through a retrorectal approach, interest was not again aroused until Cotte in 1925 performed a similar operation through a trans-peritoneal approach. It was he who first made reference to the presacral nerve. Since publication of this monograph, the transition of indications for the operation has been remarkable, and the results in proper selection of patients most gratifying.

The presacral nerve is an individual one in about 20% of the cases, and is herein referred to as the nerve of Latarjet and Bonnet. In the remainder of the cases it has been described as a plexus of fibres by Delmas and Laux, and in 2% of these, Elaut stated that the plexus thus formed is arched. Whether a plexus or a single nerve, it is made up entirely of sympathetic fibres with communications above to the semilunar, coeliac, renal and superior mesenteric ganglia. Lateral communications are received from the 1st to the 4th lumbar ganglia. The nerves thus formed lie over the promontory of the sacrum just below the bifurcation of the abdominal aorta into the common iliacs, separated from the pelvic viscera by a layer of parietal peritoneum and areolar tissue. In this relationship they run intimately with the middle sacral vessels. The distal fibres communicate with the pelvic organs and continue inferiorly as the hypogastric nerves.

Much has been learned in late years regarding the physiology of the presacral sympathetics. Learmouth stimulated the nerves in patients at the time of operation and corroborated his information by intravenous administration of epinephrine. The effects were opposite to that of section of the nerve. Briefly, the presacral neurectomy will relax the utero-vesical orifices, cause relaxation of the trigone and internal sphincter ani, relaxation of the musculature of the prostate, seminal vesicles and ejaculatory ducts, interruption of pain fibres from the uterus and bladder, increase of activity of the lower portion of the colon, and indirectly a decrease in the residual urine of the bladder and uterers. From this experimental knowledge, one can easily see what a vast field of clinical usefulness resection of the nerve might have.

Our consideration of presacral sympathectomy is principally with regard to the indications for the procedure. A few remarks seem pertinent with each one that we have tabulated.

PRIMARY DYSMENORRHEA

This is where the operation has its greatest usefulness. Under normal conditions most women do not have menstrual pain. Older gynecologist thought that those who suffered at the catamensis do so because of a stenosis. The theory of uterine displacement and stenosis cannot be an explanation of the pain for the cervix is easily dilated, and dilation will not relieve the condition. Novak has shown that the rate of flow of mentrual blood is about two-thirds drop per minute, and he remarked that retention of this small amount could hardly explain the pelvic pain these women have. Others have postulated that hypoplasia and infantile development are causative factors, but this is not the case, for most women with dysmenorrhea have normal sized uteri. Thus far there are three possible explanations for the menstrual pain in face of no other demonstrable pathology: (1) endocrine factors; for some are relieved after coitus and pregnancy, (2) sympathetic imbalance, as we will show that the presacral section will relieve these individuals, and (3) psychic elements, which can never be overlooked. Many of these patinets have other associated disorders, as vaginismus, tenesmus, cystalgia, vesical neck spasm, vulvar pruritus, genital hyper-excitatio, etc.

SECONDARY DYSMENORRHEA

Frequently when the surgeon corrects other pelvi pathology, he does not feel that there will be a total abolition of pain. Presacral neurectomy interrupts pain fibres from the bladder and uterus, but will not alter the menstrual cycle or bladder reflex. It has no effect on sexual potency ~~on secual potency~~ in the female. It is particularly valuabe in cases of endometriosis where one wishes to conserve ovarian tissue in a youthful patient.

INOPERABLE NEOPLASMS AND PELVIC TUBERCULOSIS

Here all sympathetic fibres are destroyed by the operation, but there may be some residual pain through the parasympathetics. The true value of the operation in these conditions is in the reduction of opiates after the neurectomy has been performed.

PAINFUL BLADDER OF MUSCULAR ORIGIN, BLADDER PARESIS, HYDRO-URETER, VESICAL NECK SPASM

The operation is applicable to either the male or female; however, neurectomy in the male renders him steril but not impotent. In the investigation of the urinary tract,

intramuscular injection of acetylcholine will dilate the ureteral orifices under direct visualization, and one may then expect results from nerve sectioning. Cord bladder of other than leutic origin gives gratifying results after presacral interruption due to the parasympathetic imbalance which exists; the latter fibres are interrupted and the condition becomes "balanced." Leutic cord bladder should be treated by none other than antileutic therapy.

HIRSCHPRUNG'S OR MYA'S DISEASE

The etiology here is unknown but there are five theories prominent: (1) congenital defects, (2) obstruction due to elongation of the mesetery, torsion of a segment, or multiplication of colonic loops, (3) anatomic factors, as valve defects, muscular aplasia above the rectum, (4) ineffective processes, and (5) neurogenic processes. The condition is first observed usually in childhood where males predominate three to one. The symptoms may vary from a mild constipation to obstipation, with alternating diarrhea, distention, and emaciation. A gigantism of the colon is found, with thickening of all layers, especially the muscularis. The fact that lumbar sympathectomy relieved some of these patients led to an attack on the presacral nerve. Most authorities as Wade and Royle, Adson, Learmouth, Rankin, Judd and Flothow agree that presacral neurectomy is the procedure of choice, together with lumbar ganglionectomy if the condition is severe enough to justify the added surgery. The degree of the megacolon therefore predetermines the extent of the nerve resection. We caution here the application of sympathectomy in patients who are colon conscious; pitfalls are certain to result in performance of the operation in those patients who have a faulty or labile nervous system.

TECHNIQUE OF OPERATION

The abdomen is explored through an ample low midline incision extending well above the umbilicus. The small intestines are packed out of the pelvis and the colon is held to the left. A longitudinal incision is made over the prominatory of the sacrum well above the bifurcation of the aorta. The plexus or trunk is divided above the level of the bifurcation, the internal ileac arteries are stripped of their fibres. About three or four inches of the nerve is removed. The ureters are identified and kept under vision. There is usually very little bleeding. Loose aortar tissue with nerve fibres are completely stripped from the ileac vein. The posterior peritoneum is closed without drainage after complete hemostasis.

The procedure is readily and completely done. We prefer spinal anesthesia because of the splendid relaxation afforded. Since the operation has been more completely done the results have been better. The leg aches and cramps at the time of period have disappeared in the cases in which the ileac arteries have been stripped.

DISCUSSION

We have performed the operation in seventy-two cases with uniformly good results. There is no more grateful patient in surgery than the one completely relieved of menstrual pain. These patients usually are not aware when the period starts. There is no sexual disturbance. Many of the patients have, since operation, become pregnant and have delivered normally (10 known pregnancies—8 normal deliveries—2 induced abortions). They are also spared the contraction pains of delivery, usually having only the pressure symptoms in the perineum and rectum. The uterine contractions are not interfered with. Most of the operations have been on young individuals.

In operating for acute appendicitis, if the pathology in the appendix is not severe enough to prevent sympathectomy in the patient with menstrual cramps the procedure is carried out. The risk involved is small. There has been no mortality in this series. One case developed thrombo phlebitis in the left leg. In three cases sympathectomy was done for mega colon with improvement in all. Three cases were done for indefinite pelvic pain in patients with chronic nervous exhaustion with very little, if any, improvement, and we are sure that this group should be excluded.

We do not rely on corrective procedures such as excision of cysts, suspensions, etc., to relieve all of the menstrual pain, but rather do the presacral sympathectomy as well. Three cases with bladder tuberculosis were all relieved to a great extent symptomatically. For relief of the pain of pelvic malignancy the operation has been done with improvement, and in some cases of resection of the rectum and sigmoid for carcinoma the sympathectomy has been done. There have been no deaths in this series.

CONCLUSIONS

Presacral neurectomy has a definite place in the armamentarium of the gynecologist and surgeon.

It has its greatest usefulness in cases of primary dysmenorrhea, but may be used as an adjunct in the treatment of other pelvic pathology.

Good results may be derived from the relief of pain in cases of bladder neck dysfunction and bladder paresis of non-luetic origin.

It may afford relief of pain in far advanced carcinoma and tuberculosis of the pelvis, or relief of idiopathic mega colon.

The risk of the operation is negligible if a careful anatomic dissection is carred out.

Regional Enteritis

By

JOHN ROBERTS PHILLIPS, M.D.*

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THIS relatively new disease is being seen more commonly and the accuracy of diagnosis is well represented in the case to be reported, in that, in spite of the fact that the patient had multiple conditions the true nature of the situation was well understood and

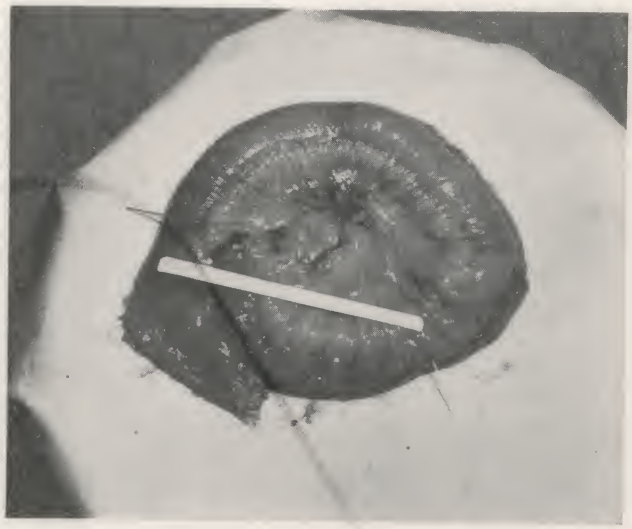

Fig. 1. The resected specimen of ileum with its accompanying mesentery and glands is shown.

the process localized definitely before exploration. This has been possible due to the fact that the condition was thought of and an x-ray of the small bowel carried out.

Case Report: The patient was a white male, age 62,

Submitted Dec. 14. 1944.

*Diplomate of American Board of Surgery

Caucasian, City Fireman. He first began having symptoms in 1942, which symptoms consisted of severe lower abdominal colicky pain associated with some distension and some nausea but no vomiting. There had been no change in the stool findings. There had never been any bleeding, and there had been no diarrhea. There had been a tendency to constipation. He had lost his appetite and during the period from November, 1942 until February 15th, 1943, at which time he was first seen by me, he had lost sixteen pounds in weight. Because of his obstructive symptoms it was thought

Fig. 2. The opened bowel shows a very thickened, rubbery wall with extensive ulceration.

that, at his age, he might have a new growth in his colon. Proctoscopic examination was entirely negative for 25 centimeters. An x-ray of his colon revealed multiple diverticula of the sigmoid colon, but without any evidence of obstruction or inflammation, although it had been presumed previously that the diverticula had caused trouble and certainly this was a definite

possibility. The question arose as to whether he might not have some adherence of the sigmoid to the bladder due to the fact that he had had some attacks of urinary tract infection, however, the pylorograms and cystogram were entirely negative. There was no evidence of any internal fistula. An x-ray of the small bowel revealed an obstructive lesion involving the lower ileum. The lower six inches of the ileum was normal. The pre-operative diagnosis therefore was made of regional enteritis, involving the ileum, the lower six inches of the ileum being entirely negative.

Exploration was carried out on February 15th, 1943, at which time the entire colon was explored and found to be negative except for multiple diverticula without evidence of inflammation. There were no adhesions. The omentum was free. The ileum was involved for a distance of about twenty four inches, the ileum being very markedly thickened and indurated. The accompanying mesentery glands were quite markedly swollen. The lower six inches of the ileum was not involved. The cecum was quite normal. Examination of the remaining portion of the small intestine revealed no other area of enteritis. About twenty-four inches of the ileum was removed, together with its mesentery glands. The terminal ileum was inverted and the proximal ileum was anastomosed to the transverse colon by an end to side ileocolostomy. The patient was given 500 CC's of citrated blood. His immediate and subsequent post-operative course was quite uneventful. Nasal suction was instituted for the first five days. After that he was allowed to take his fluids by mouth. Pathological examination revealed an ulcerative enteritis of the ileum, the bowel wall being quite thickened. There was no evidence of any tuberculosis. The patient was allowed to leave the hospital on the tenth post-operative day and progressively and rapidly improved. He was able to return to his duties as a city fireman within six weeks and within three months had gained twenty pounds in weight. His bowels were working normally and a check-up x-ray revealed that his ileo-colostomy

was functioning quite normally. His condition has continued to remain quite well.

COMMENT

We ordinarily look upon a condition of regional enteritis being a condition occurring in young individuals. It is more common in the male sex. The terminal ileum is involved in the majority of cases but any part of the intestinal tract can be involved. Cases of involvement of the terminal ileum and cecum are now being reported. Also multiple areas of involvement are not uncommon. It is common enough so that multiple areas should always be looked for. I feel that primary resection should be carried out whenever advisable.

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Funnel Chest

Report of Case Successfully Treated by Chondro-sternal Resection

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Funnel Chest: Report of Case Successfully Treated by Chondro-sternal Resection

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Funnel chest (chone-chondrosternon, pectus excavatum) usually is a congenital, but may be an acquired, condition. There is a depression of the lower portion of the sternum with the costal cartilages, which has a tendency to become worse as the individual grows older. Chone-chondrosternon is the name that has been given to the condition by Ochsner and DeBakey,[1] who have made a very extensive review of the literature and reported a case of their own. They very carefully reviewed the records of thirty-two patients who had been operated upon during the past twenty-seven years. Since then, Brown[2] reports on three radically operated cases and reports four cases developing pectus excavatum upon whom a palliative operation was performed. Haberlin[3] has also successfully operated upon one case. The very fact that so few cases have been operated upon does not mean that the condition does not occur more frequently with symptoms severe enough to require operation.

Operation undoubtedly has been denied many patients who could have been benefited surgically. There are three methods of attacking such a condition. The three types of operative procedure are: (1) Chondro-sternal resection. Ten cases had been treated by this procedure with successful results in eight, and death occurred in two. (2) T-Sternotomy, with or without costal-cartilage division, was carried out in fourteen cases. Eight cases were successful, two failed, and death resulted in four. (3) Sternal mobilization with chondral division or resection. This undoubtedly is the operation of choice, because a better thoracic cage will result. Eight cases have been operated upon by this procedure with seven satisfactory results and one failure.

I wish to add a case in which chondro-sternal resection was carried out. Because of the marked deformity of the sternum with rotation, it was felt that resection of the sternum and cartilages was the operation of choice; and a very satisfactory end result was obtained.

Case Report—The patient is a white female, age 21, whose chief complaints were shortness of breath, increasing deformity of the chest and pain and discomfort in the chest. Some deformity had been present as long as she could remember. It had increased in the past two years. She had been working in a defense plant up until the present time. She found

it necessary to stop work because of increasing difficulty with shortness of breath and pain in her chest, and a feeling of pressure on the heart. The pulse rate had been increasing. She had a feeling of a constriction of the chest and she was quite conscious of her heart. These symptoms had become much worse within the last three or four months and in addition to her symptoms she had become quite sensitive about the deformity of the chest and a tendency to stooping of her shoulders. There was also some lack in development of the left breast, it being about half the size of the right breast. Her general physical examination otherwise was negative. There were no abnormal heart sounds. The x-ray of the chest revealed some displacement of the heart toward the right side. The costal arch, on the left, shingled over the sternum so that about one-half of the sternum was under the arch, and there was a marked depression of the sternum with the costal arch on the right side and to the lesser degree on the left side. The blood pressure was 120 over 70, the pulse was 100, and there was a rather marked tendency for the patient to bend forward from the shoulders. The patient had no history of injury, and her general physical condition had always been good. There was no history in the family of abnormality in development as far as she could determine. The urine analysis, blood counts and blood Wassermann tests were all within normal limits.

She was operated upon January 10, 1944. A resection of the xiphoid and body of the sternum, together with the 3rd, 4th, 5th and 6th chondral cartilages on each side was carried out through a curved incision over the sternum. The chondral cartilages on the left were abnormally attached to about the level of the 3rd chondral articulation. They all seemed to run up to this area in a knob formation. They were shingled over each other and the sternum was shingled under these cartilages on the left

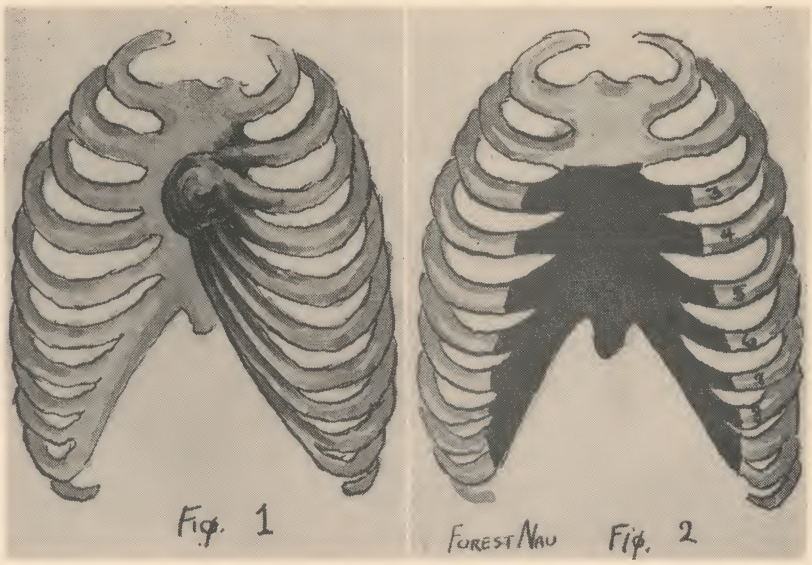


Fig. 1—Artist's drawing of shingling of the ribs over the sternum. *Fig. 2*—Showing the amount of chondrosternal resection that was carried out.

side. The chondral arch was completely resected with the cartilages and the pericardium peeled away from the posterior part of the sternum. The pleura and pericardium were dissected away without entering into either of these cavities. Due to the marked deformity over the body of the sternum I felt it advisable to resect the sternum rather than to fracture it and hold it in place with wire. The bleeding from the body of the sternum was controlled by bone wax. One penrose drain was left over the pericardium and brought out through the lower angle of the incision. Five grams of sulfanilamide was left in the wound. The patient was given 500 cc. of blood at the completion of the operation. The operation was done under intratracheal cyclopropane anesthesia. The whole procedure took about an hour and forty minutes and really worked out very well. The patient's immediate postoperative course was very good. She showed no evidence of any cardiac embarrassment, or abnormality. Her temperature never ran over 100°; on the fifth day she was allowed to sit on the side of the bed, and by the end of the week she was out of bed and walking around in the ward. She was allowed to leave the hospital in ten days and has progressively improved. The heart action has been perfectly normal, with rather active pulsation over the precardial area, but this in no way disturbs the patient. The deformity has been largely corrected. She does not have the feeling of pulling over of her chest, and two months after operation she was allowed to return to her usual duties in a defense plant. Her convalescence really was without incident.

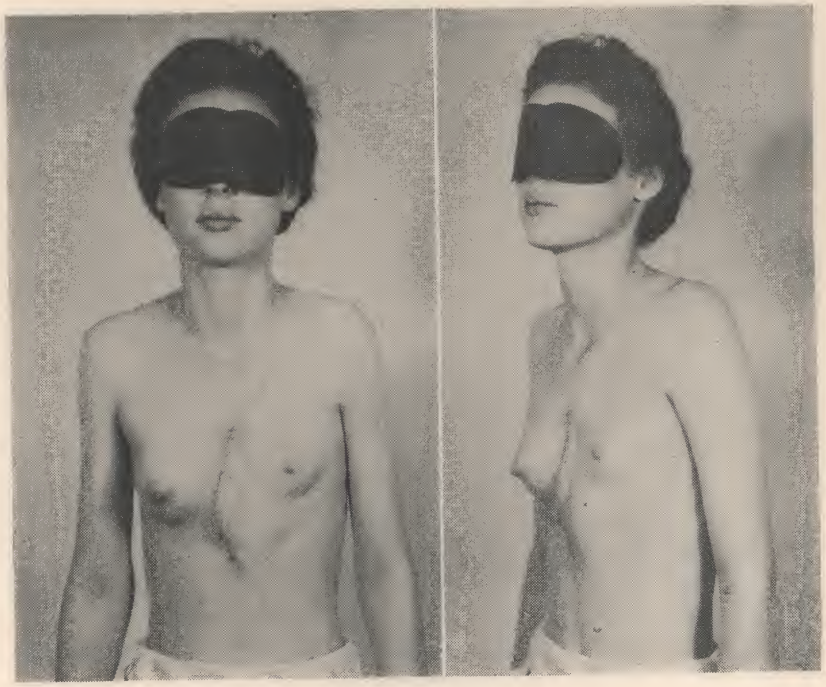
Front and side views preoperatively.

SUMMARY

Another case of successful resection of the sternum with the chondral cartilages on each side for depression of the sternum and costal cartilages has been reported. It is felt that the operation of choice in these cases would be sternal mobilization rather than resection, but in this case, due to the marked deformity of the costal arch, together with the rotation of the sternum, resection was necessary. It is true the entire literature does not contain enough case reports to actively determine which procedure will carry the highest incidence of cure. The mortality rate in resection of the sternum should be no higher than the mortality rate in sternal mobilization. This brings the number of cases that have been operated upon by a radical procedure reported in the literature to thirty-eight. In children a less radical procedure of dividing the diaphragmatic attachment to the sternum will usually stop the progress of the condition.

RESUMEN

Se informa sobre otro caso de resección del esternón y de los cartílagos de ambos lados, ejecutada con buen éxito para corregir la depresión del esternón y de los cartílagos costales. Se opina que



Front and side views two weeks postoperatively.

la operación de elección en estos casos sería la movilización del esternón más bien que la resección; pero en este caso, debido a la gran deformidad del arco costal y a la rotación del esternón, la resección fue necesaria. Es cierto que la entera literatura no contiene suficiente número de informes de casos para determinar adecuadamente cuál procedimiento obtendría el mayor número de curaciones. La mortalidad en la resección del esternón no debe ser más alta que la mortalidad en la movilización del esternón. Este eleva a treinta y ocho el número de casos sometidos a una operación radical, que se han presentado en la literatura. En los niños el procedimiento menos radical de dividir la unión del diafragma con el esternón por lo general interrumpe el progreso de este estado.

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INJURIES TO THE LOWER URETERS SECONDARY TO PELVIC SURGERY

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INJURIES TO THE LOWER URETERS SECONDARY TO PELVIC SURGERY

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INJURIES to one or both ureters are infrequent complications of pelvic surgical procedures in both sexes. Because of the far greater incidence of pelvic operations in the female, the literature has dealt mostly with the injuries to the female ureter; but these injuries occur in the male as complications of diverticulectomy, repair of rectovesical fistulas, resection of the large bowel, suprapubic and perineal prostatectomy, transurethral prostatic resection, seminal vesiculectomy, and instrumental procedures in the lower ureter.

OCCURRENCE OF INJURIES

A review of the literature dealing mostly with gynecologic procedures reveals the incidence of ureteral injuries to be about 1 to 3 per cent (table 1). Because ureteral injury is a complication with serious sequalae to both patient and doctor, many cases may not be reported, and the actual incidence may be higher than is apparent. Table 2 shows some of the more common procedures associated with ureteral injuries that have been reported in the literature. Total hysterectomy leads the lists, followed by the radical Wertheim operation and operative procedures in the adnexal region of the female pelvis. The Wertheim operation suffered in popularity for a time, but stimulated by the work of Meigs and others, it is now being used as the treatment of choice in many cases. The cases injured during the Wertheim procedure were reported by Brown[2] in 1934 and Feiner[7] in 1938. Feiner's cases were operated upon from 1925 to 1936. Feiner[7] reported 35 cases of ureteral injury occurring during vaginal hysterectomy. The percentage of ureters injured during vaginal hysterectomies may be higher than during abdominal hysterectomies, but the total number injured is lower by the vaginal route because most of the operators utilize the abdominal route for the majority of their cases.

The percentage of ureters injured during subtotal hysterectomy is much less than during those procedures requiring dissection deep in the pelvis. A few cases of ureteral injury have been reported during resection of the rectum and rectosigmoid and during obstetric procedures. It is not uncommon for the ureter to be injured during urologic instrumental procedures, especially cystoscopic extraction of calculi from the lower ureter and dilatation of lower ureteral strictures. This hazard is increased by the use of semi-rigid and metal tipped instruments in the ureter.

TABLE 1.—*Incidence of Ureteral Injuries.*

Reference	No. Cases	Types of Cases	No. Ureteral Injuries	% Ureteral Injuries	Remarks
Stevens[16]	27,708	General hospital admissions	5	<1	San Francisco Hospital
Stevens[16]	1,086	Pelvic surgery, gynecology	4	<1	Stanford University Hospital
Feiner[7]	Review of 11 yr. period	Pelvic surgery, gynecology	260	3	
Leventhal[10]	Not stated	Not stated	Not stated	1-3	
Herman[8]	7,966	Pelvic surgery, gynecology	4	<1	
Adam (cited in Herman[8])	Review of literature to 1943	Pelvic surgery, gynecology	782		
Newell[12]	3,144	Pelvic surgery, gynecology	15	<1	23 yr. study at Barnes Hospital

The close association of the pelvic ureter with the other pelvic structures in both sexes makes it susceptible to injury in pelvic surgical procedures. The ureter enters the pelvis at the pelvic brim near the bifurcation of the common iliac artery and courses downward, retroperitoneally, in front of the hypogastric artery. In the female, the uterine artery, one of the branches of the hypogastric, lies lateral and a little in front of the ureter and crosses in front of the ureter at the point where the ureter passes beneath the base of the broad ligament. This is just above the lateral fornix of the vagina and 1 or 2

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cm. lateral to the upper part of the cervix. The ureter then courses medially and inferiorly in front of the antero-lateral aspect of the upper part of the vagina to enter the base of the bladder. At this point the two ureters are separated from each other by about 2 inches. In the male, the vas deferens crosses in front of the ureter at the level of the ischial spine. The ureter then courses medially and inferiorly to enter the base of the bladder just in front of the fundus of the seminal vesicle.

TABLE 2.—*Surgical Procedures Associated with Injury to the Lower Ureter as Reported in the Literature.*

	Intraligamentous Cysts	Excision of Rectum and Rectosigmoid	Vaginal Hysterectomy	Subtotal Hysterectomy	Salpingo-Oophorectomy	Vesico-Vaginal Fistulas	Plastic Operation on Anterior Vaginal Wall	Obstetric Procedures	Wertheim Operation	Pelvic Inflammatory Disease	Cystoscopy and Ureteral Instrumentation	Total Hysterectomy—Abdominal	Pelvic Operations—Type Not Stated	Suprapubic Prostatectomy	Total
McIver[11]	2	2										5			9
Feiner[7]	19		35	44	24			6	54			49	5		236
Stevens[16]	2				1						4	5	4		16
Newell[12]												15			15
Brown[2]	1								5			4			10
Jenkins[9]												2			2
Herman[8]		1		1	1			1			38	4		1	47
Ockerblad[14]												1			1
Total	24	3	35	45	26	Mentioned, no cases reported	Mentioned, no cases reported	7	59	Mentioned, no cases reported	42	85	9	1	336

AVOIDING INJURIES

Novak[13] has described five danger zones for pelvic surgeons to consider: (1) where the ureters cross the iliac vessels, (2) ovarian fossae, (3) intraligamentary portion of the ureter, (4) where the ureter is crossed by the uterine artery, and (5) intravesical ureter in the repair of vesico-vaginal fistulas.

Novak[13] has also laid down six rules to aid surgeons in avoiding ureteral injury:

1. A surgeon should not undertake to perform a gynecologic operation unless he has a thorough knowledge of the anatomy of the ureters, their possible anomalies, and their possible dislocations resulting from scars, tumors, and so forth.

2. The surgeon should never lose his presence of mind in case of unexpected bleeding, nor should he try to stop bleeding by blind and hasty application of clamps or ligatures.

3. A strand of tissue should never be clamped, cut, or ligated before its identity is definitely established.

4. The ureters should be exposed and their exact location ascertained before the operation proceeds to the point where the ureters are endangered.

5. Before surgery is performed the patient should have a cystoscopy and excretory urograms to determine the anomalies and the course of the ureters.

6. All ligatures and suture material should be of easily absorbable material.

Ewell[6] recommended the routine use of preoperative excretory urograms and indwelling ureteral catheters as prophylactic measures. The majority of authors agree with Ewell on the value of preoperative study with excretory urograms, but disagree in the use of indwelling ureteral catheters to aid in locating the ureters at the time of surgery. Leventhal and others[10] expressed the belief that indwelling ureteral catheters give the surgeon a false sense of security. One of us[15] (M. K. O'H.) reported 1 case in which a normal ureter was ruptured during the preoperative insertion of a ureteral catheter. The passage of catheters up the ureters may predispose to other complications in the upper urinary tract, increase the risk of the operation, and lengthen the convalescence. Ureteral catheterization, if carefully and properly done, is usually a harmless procedure, but the majority of experienced cystoscopists have encountered complications such as infection, ureteral colic, and suppression of the urinary output. Even though these complications are rare, they are serious enough to condemn the procedure for routine preoperative use. The majority of gynecologists are in agreement with Novak[13] and Drexler[5] that the safest procedure is to locate the pelvic ureters and keep them under constant vision during the operation.

Novak's[13] plea for the use of easily absorbable suture material is not justified in view of the experimental work reported by Caulk and Fischer.[3, 4] They demonstrated that no. 2 plain catgut is not absorbed for three weeks and the surgeon cannot rely upon absorption of the suture and reopening of the ureteral lumen for the reestablishment of drainage from the involved kidney in the case of a ligated ureter. They further explained that a ligated ureter remains completely occluded for about eight weeks, or about five weeks longer than it takes a no. 2 plain catgut suture

to absorb. The epithelium at the site of the ligation is destroyed except for an isolated island here and there. Recanalization occurs as the result of the epithelium growing into the ligated area from above and below, aided by centrifugal growth in the isolated islands of epithelium in the ligated area. They believed that a ureter completely obstructed for two weeks would result in total and irreversible loss of renal function, and they recommended that these cases be handled by instituting nephrostomy drainage at once until the continuity of the ureteral lumen has been reestablished. They reported a patient with bilateral ureteral ligation who recovered after bilateral nephrostomy on the eighth postoperative day.

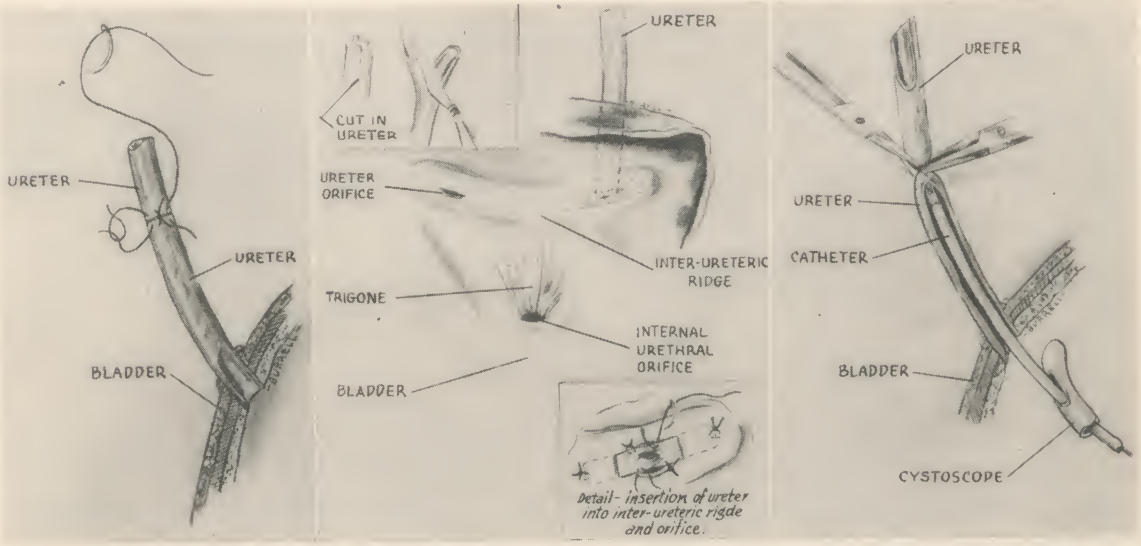

FIG. 1. Left. Drawing illustrating the technique of end to end anastomosis of the ureter.

Center. Drawings illustrating the technique of reimplantation of a ureter into the bladder.

Right. Drawing illustrating the technique of deligation of the ureter.

MANAGEMENT OF INJURIES

The various procedures utilized in the management of ureteral injuries are nephrostomy, nephrectomy, ureterostomy, pyelostomy, end-to-end anastomosis of ureter, reimplantation of ureter into the bladder, uretero-intestinal implantation, cutaneous ureterostomy, ureterovaginal implantation, deligation, and autonephrectomy.

Undoubtedly many lives were saved because Caulk and Fischer[3, 4] in 1915 urged the medical profession to perform nephrostomies as early as possible in all cases of ureteral ligation and injury. The procedure is still widely used, but to some extent has been replaced by more conservative procedures. Improvements in surgical techniques and anesthesia during the last thirty years have increased the period of time patients can safely be subjected to an operation. This allows the alert surgeon who recognizes a ureteral injury when it is inflicted, time to repair it by one of the more conservative techniques.

McIver[11] recommended the use of a T tube for end-to-end anastomosis. The end-to-end anastomosis (fig. 1 left) is usually made over a ureteral splint and nephrostomy or high ureterostomy drainage provided. We have performed end-to-end anastomosis over large ureteral catheters, French no. 6 to 10, inserted through a cystoscope and left indwelling for about eight weeks. This procedure has proved successful and nephrostomy or ureterostomy drainage has not been done in our cases.

The majority of authors recommend reimplantation of the ureter into the bladder (fig. 1 center) if the injury is low enough to permit the ureter to reach the bladder. Ockerblad[14] has devised an ingenious method of implanting short ureters into the bladder by utilizing a flap of bladder wall fashioned into a tube to bridge the gap between the ureter and bladder.

Many cases of unilateral injury are not recognized until some time after the injury and after definite changes have taken place in the upper ureter and kidney. Many of these cases will have to be nephrectomized because of sepsis and irreversible loss of renal function. Some patients will develop fistulas, as did 3 of ours, and later the ureter may recanalize, as it did in 1 of our cases. Secondary to the obstruction, at the site of injury, hydronephrosis and a large tortuous dilated ureter will develop. If the degree of infection and the remaining renal function will justify conservative surgery, this tortuous ureter can be straightened out and it will be more than long enough

to reimplant into the bladder, as we did in 3 of our cases.

Barrett[1] has suggested ureterocolostomy in high ureteral injuries, but this procedure will not give the good functional result of an end-to-end anastomosis. Cutaneous ureterostomy and vaginal ureterostomy have been mentioned, but the functional result would be unsatisfactory and these procedures should be used rarely, if at all.

Deligation associated with nephrostomy drainage has been advocated by numerous authors. Thorek,[17] Drexler,[5] and Ewell[6] recommended immediate nephrostomy followed by deligation at a later date. Caulk and Fischer[3, 4] considered deligation an unnecessary operative hazard, preferring to handle their cases of nephrostomy and then waiting for recanalization of the ligated ureter. They also objected to the use of bougies to dilate the strictured recanalized ureter on the grounds that this was unnecessary trauma. Feiner[7] recommended immediate deligation (fig. 1 right) in preference to the nephrostomy. In 1 case of bilateral ligation, we performed bilateral deligation immediately and inserted ureteral catheters. Autonephrectomy, resulting from complete occlusion of the ureter, does occur, but cannot be relied upon to occur with any degree of consistency. Many of these cases will develop fistulas later, and others may require nephrectomy for the relief of pain or sepsis.

CASE REPORTS

CASE 1.—L. A., a 21 year old white man, on June 29, 1946, complained of recurring attacks of dysuria for the past eighteen months. A recent excretory urogram revealed a large diverticulum on the right side of the bladder. The remainder of the history was irrelevant. The physical examination was essentially normal. The blood pressure was 132 systolic and 85 diastolic. Rectal examination of the prostate and seminal vesicles revealed normal structures. The urinalysis was normal except for an occasional blood cell. The blood count was normal. The blood nonprotein nitrogen was 32.2 mg. per 100 cc. A routine chest roentgenogram was normal. An excretory urogram revealed excellent renal function and normal pyelograms bilaterally (fig. 2 left). However, there was a large diverticulum above the right side of the bladder. A retrograde cystogram confirmed this observation. Cystoscopy revealed a contracted bladder neck with several incrustations on it. The bladder showed evidence of chronic infection and was coarsely trabeculated. On the right side was the opening of a large diverticulum, and the right ureter emptied into this diverticulum. On the left side, just above the ureteral orifice, was the opening of a smaller diverticulum. Urethroscopy revealed a high prostatic median bar.

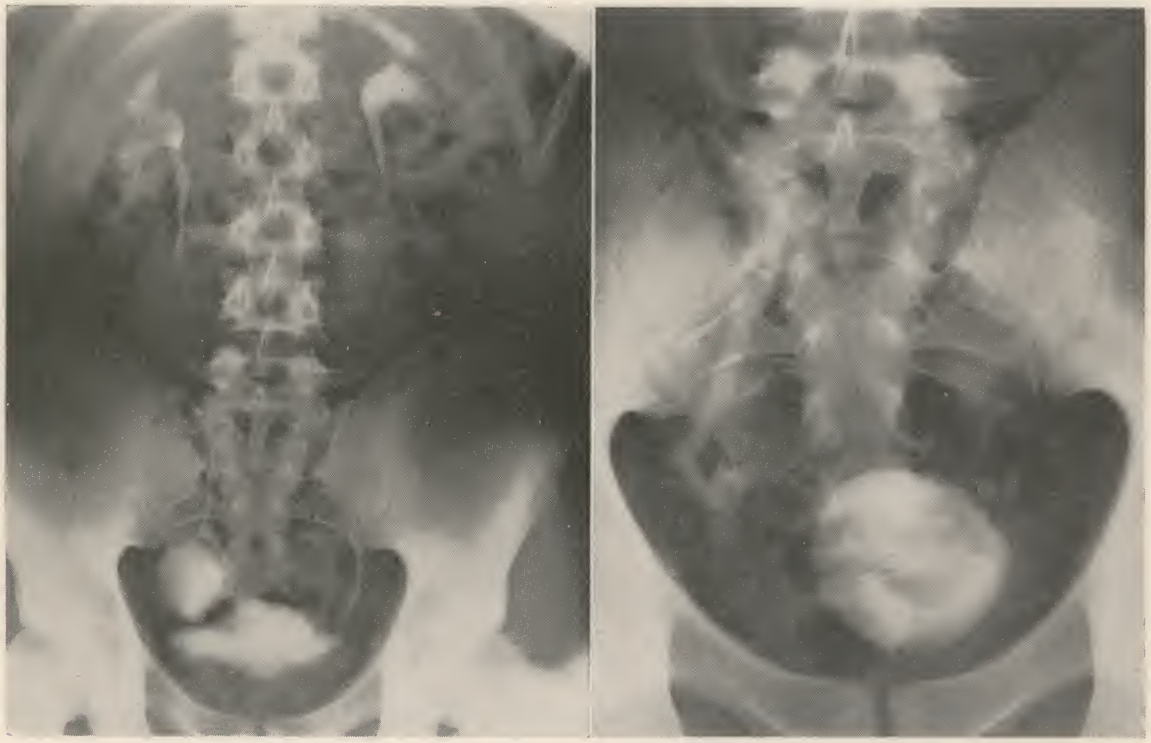

FIG. 2. Left. Preoperative intravenous pyelograms showing a large diverticulum with the right ureter emptying into it in case 1. Right. Postoperative intravenous pyelogram showing the reimplanted right ureter separated from the bladder in case 1.

On July 11, 1946, suprapubic cystotomy was performed by one of us (M. K. O'H.). The large diverticulum on the right side was excised and the right ureter reimplanted into the bladder. The median bar was excised. A ureterostomy tube was left in the right ureter and cystotomy drainage provided. The postoperative course was uneventful. On the

thirteenth day the ureterostomy tube was removed. On the twentieth day, the patient was sent home, although the cystotomy wound was still draining. The drainage continued. Cystoscopy on the thirty-seventh postoperative day revealed a great deal of edema about the ureteral opening on the right side. An excretory urogram on the forty-first postoperative day (fig. 2 right) revealed the transplanted ureter to be pulled loose and retracted away from the bladder.

The patient was readmitted to the hospital and on the forty-fourth postoperative day surgery was again performed. The retracted right ureter was found and reimplanted into the bladder with a small catheter serving both as a splint and a ureterostomy tube. Suprapubic cystotomy drainage was provided. The postoperative course was uneventful. The ureterostomy tube was removed on the twenty-third postoperative day. The patient was discharged from the hospital on the thirty-third postoperative day. Shortly afterwards he returned to work and has been symptom free since. He still has a few pus cells in the urine. Twenty-two months later cystoscopy was performed and the right (transplanted) ureter was catheterized. The urinalysis was normal. Renal function, as determined by indigo-carmine excretion, was normal. A retrograde pyelogram revealed a normal right pyelo-ureterogram.

Comment.—This reimplanted ureter probably pulled loose from the bladder because it was improperly sutured or else was so tense that the blood supply was poor.

CASE 2.—Mrs. O. W., a 38 year old white woman, was first seen by two of us (M. K. O'H. and A. W. M.) on November 30, 1946, complaining of leaking urine through her vagina for the past seven weeks. About two months before, an abdominal total hysterectomy had been performed. Following the operation she suffered a great deal from abdominal distension and pain in the lower abdomen. On the twelfth postoperative day she suddenly passed urine through her vagina and her pain subsided. The physical examination was essentially normal. The blood count revealed a mild secondary anemia. The urine was loaded with pus cells and had 4 plus albumin. Smear and culture of the urine were negative. The blood nonprotein nitrogen was 20 mg. per 100 cc. Cystoscopy revealed a normal bladder except for generalized chronic inflammation. Both ureters were catheterized with ease. There was no obstruction on the right. On the left an impassable obstruction was encountered at 5 cm. A preliminary roentgenogram was negative for calculi. Excretory urograms revealed a normal pyelo-ureterogram on the right side. On the left side was a moderate hydronephrosis and hydro-ureter extending down to near the pelvic brim.

Surgery was performed by one of us (M. K. O'H.) on December 6, 1946. A left oblique incision was made into the lower abdomen. The entire operation was retroperitoneal. The ureter was found to be greatly dilated above the point of constriction. It was reimplanted into the bladder and suprapubic drainage was established. A rubber catheter was left indwelling in the left ureter for fifty-nine days. The patient was discharged from the hospital on the thirty-sixth postoperative day. The convalescence was uneventful. Four months after the operation she had a cystoscopy in the office and the transplanted ureter was catheterized with a French no. 8 catheter. There was no obstruction present. One year after the operation an excretory urogram was normal bilaterally (fig. 3 left) and the patient was asymptomatic.

Comment.—This ureter was probably ligated at the time hysterectomy was performed and instead of an autonephrectomy developing a uretero-vaginal fistula formed. This resulted in a hydronephrosis, but renal function was not permanently impaired, as evidenced by the fact that the kidney is now normal. Had this injury been recognized at the time it was incurred, an end-to-end anastomosis could

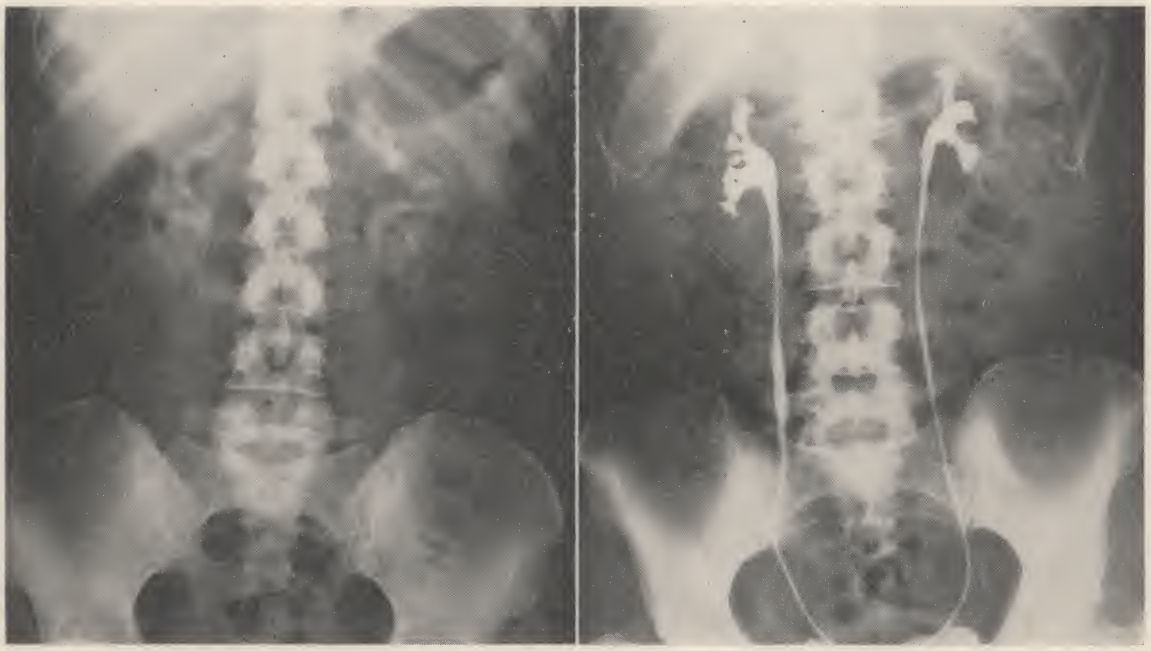

FIG. 3. Left. Excretory urogram made one year following reimplantation of the left ureter into the bladder in case 2.

Right. Retrograde pyelograms made on the ninety-fourth postoperative day following bilateral ureteral deligation in case 3.

have been done and the period of morbidity would have been less.

CASE 3.—Mrs. A. M., a 37 year old white woman, was operated upon on October 20, 1947. Total hysterectomy was performed because of multiple uterine fibroids. Both ovaries, tubes, and the appendix were also removed. One of the fibroids was imbedded deep in the cul-de-sac and in removing it, considerable difficulty was experienced in controlling the hemorrhage. To control some of the bleeding points, the surgeon found it necessary to transfix some of the ligatures. The operation required three hours and twenty minutes. The patient received intravenous glucose and blood plasma during the operation and 900 cc. of whole blood following. Eleven hours later she had not passed any urine, and two of us (J. R. P. and M. K. O'H.) were called in consultation.

Cystoscopy and ureteral catheterization revealed an obstruction in both ureters 3 to 4 cm. above the bladder. The abdominal wound was reopened and both ureters were found ligated just above the bladder. The right ureter was intact, but the left had been incised. Deligation was performed and the cystoscopist passed French no. 6 ureteral catheters by the points of obstruction and into the renal pelvis on each side. The opening in the left ureter was not sutured. The area was drained with Penrose drains and the abdominal wound closed. The ureteral catheters were placed inside a French no. 26 Foley catheter and left indwelling in the bladder. On the twenty-fifth postoperative day the French no 6 ureteral catheters were removed and French no. 7 ureteral catheters were passed up both ureters and left indwelling. Retrograde pyelograms were normal bilaterally. Some urine drained through the abdominal wound for twenty-eight days; then it ceased altogether. However, from the first postoperative day the patient passed a large amount of urine from the urethral catheter. She left the hospital on the forty-third postoperative day. The urethral and ureteral catheters were removed on the fifty-sixth postoperative day. Following this, the ureters were dilated with French no. 10 ureteral catheters every two weeks for a total of six dilatations on each side. On the ninety-fourth postoperative day bilateral retrograde pyelograms were normal (fig. 3 right). Renal function, as determined by the appearance time of indigo-carmine solution, was normal. The patient was doing her own housework and was free of symptoms.

Comment.—Bilateral ureteral ligation, with an incision into the left ureter, was probably caused by the difficulty encountered by the surgeon in controlling the hemorrhage. This case demonstrated the value of indwelling ureteral catheters in providing drainage from the upper urinary tract and avoidance of the more serious procedure of bilateral nephrostomy.

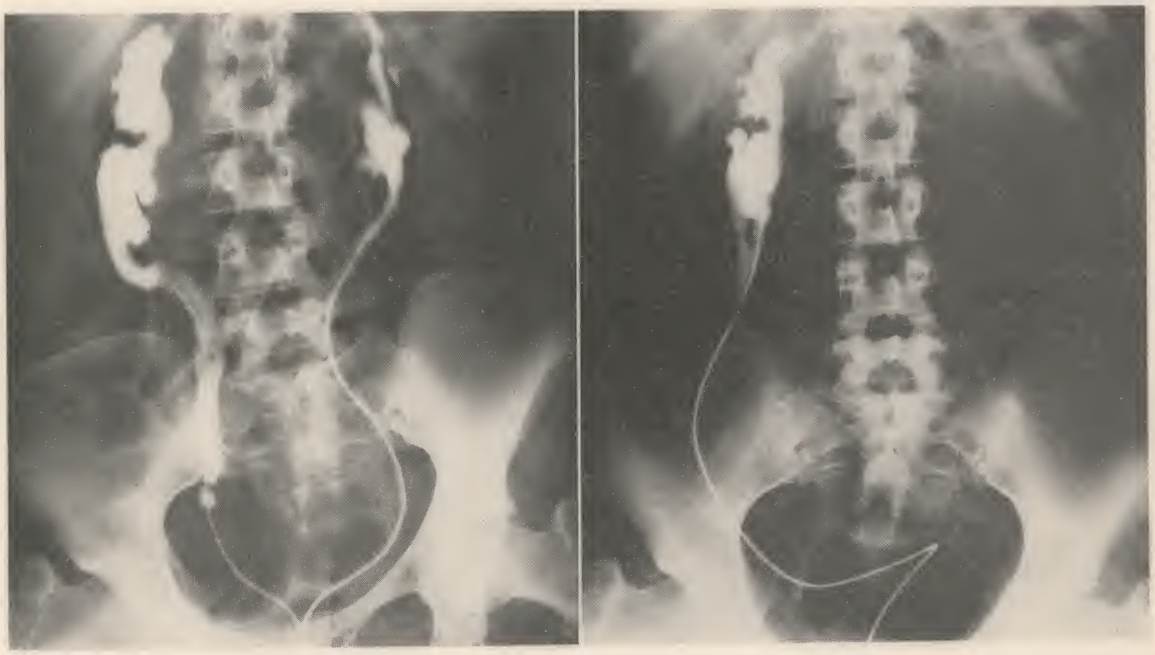

FIG. 4. Left. Preoperative pyelograms showing a horse-shoe kidney and point of injury in the lower right ureter in case 4.

Right. Right retrograde pyelogram made on the eighty-fourth postoperative day following reimplantation of the right ureter into the bladder in case 4.

CASE 4.—Mrs. L. C., a 26 year old white woman, was first seen by two of us (M. K. O'H. and A. W. M.) on October 18, 1947, because of pain in the right kidney region, chills, and fever. Seven months previous a laparotomy was performed in a nearby city and an intraligamentous cyst was removed from the right side of the pelvis. A few hours after the operation the patient developed a hemorrhage and was returned to the operating room. The wound was reopened and the hemorrhage successfully controlled. Following this, she developed pain in the right kidney area and started having frequent chills and fever. A few weeks after the operation she developed what was thought to be ascites and over 3 gallons of fluid was removed by paracentesis. Her condition slowly grew worse and after seven months she came to us.

An examination revealed a markedly emaciated and extremely ill woman. Every day her temperature rose to from 103 to 104 F. Many of these elevations were preceded by

chills. She had a marked anemia, and the urine was loaded with pus. The blood nonprotein nitrogen was normal. An excretory urogram revealed a horseshoe kidney with poor function and inadequate filling on the right side. Cystoscopy was performed and after some difficulty a French no. 5 ureteral catheter was passed up the right ureter. An obstruction was encountered and passed at about 7 cm. (fig. 4 left). The patient was prepared for surgery and on October 23, 1947, the right ureter was reimplanted into the bladder. A large rubber tube was left indwelling in the ureter to serve both as a splint and ureterostomy tube.

The postoperative course was uneventful. The temperature dropped to normal. The patient gained weight and began to feel good. The ureteral catheter was removed in seven weeks and she was permitted to go home. She returned for a follow-up examination on the eighty-fourth postoperative day. At that time she stated she was feeling good, and had regained all of her weight. The urine still contained some pus. An excretory urogram revealed what appeared to be a hydronephrotic right kidney, but a retrograde pyelogram (fig. 4 right) revealed a kidney that might be regarded as within normal limits when considered as the right half of a horseshoe kidney. Ten months later the patient was in good health, and a right retrograde pyelogram was within normal limits.

Comment.—The right ureter was probably ligated or ligated and cut at the time the patient was returned to the operating room for the control of the postoperative hemorrhage. Following this, she probably developed a ureteroperitoneal fistula, and the ascitic fluid removed was probably urine. In the meantime the ureter recanalized, but obstruction was still present, necessitating a reimplantation of the ureter into the bladder.

CASE 5.—O. L., a 41 year old white woman, was seen by one of us (J. R. P.) on November 11, 1946, because she was passing urine through her vagina. She stated that forty-nine days prior to this visit she had undergone a laparotomy for endometriosis. Following this, she had severe pain in the left kidney area and after about two weeks began to leak urine through her vagina. She was weak, had lost considerable weight, and felt that something was wrong with her left kidney and bladder. Examination revealed a vesico-vaginal fistula about 1 inch in diameter. Excretory urograms revealed a large left hydronephrosis and hydroureter. On November 13, surgery was performed by one of us (J. R. P.). The vesico-vaginal fistula was repaired and a left nephro-ureterectomy was performed. The postoperative course was uneventful, and when seen last, fourteen months later, the patient was feeling good and was free of symptoms.

CASE 6.—Mrs. A. H., a 20 year old white woman, was operated upon on February 6, 1948. A large intraligamentous cyst was removed from the right side of the pelvis, and during the procedure the right ureter was accidentally cut about 6 cm. above the bladder. The surgeon recognized the mistake at once, and one of us (M. K. O'H.) was called in consultation. Following the completion of the gynecologic procedure, cystoscopy was performed and the right ureter was catheterized with a French no. 8 ureteral catheter. This was passed through the distal segment of the ureter and coiled up in the peritoneal cavity. The distal end of the ureteral catheter was then placed inside a French no. 26 Foley catheter left indwelling in the bladder. The proximal end of the ureteral catheter was then passed up the proximal segment of the ureter into the renal pelvis. Both ends of the severed ureter were then dissected free for a distance of about 2 cm. from the cut, and an end-to-end anastomosis was performed over the ureteral catheter with 5-0 chromic gut sutures. The ureteral bed was drained with a Penrose drain and the abdomen was closed. The patient is now well and symptom free. Retrograde pyelograms made on the forty-ninth operative day were normal.

Comment.—This alert surgeon recognized and admitted his mistake as soon as it was made, thereby permitting an end-to-end anastomosis of the cut ureter over a ureteral catheter.

CASE 7.—C. T., a 60 year old man, was seen by us on January 30, 1948, because of severe pain in the left groin and the left side of the perineum and scrotum for the past fifteen months. Fifteen months previous he had a radical abdomino-perineal resection of the bowel for carcinoma of the rectosigmoid. The pain in the left groin became so bad that about seven months later he was reoperated on because a recurrence of the carcinoma was suspected. No evidence of carcinoma was found.

Examination revealed a poorly nourished man, with a transverse colostomy in the left upper quadrant of the abdomen. There was a moderate anemia present. The urine was essentially normal. Cystoscopy was performed under spinal anesthesia. The bladder was normal. The right ureter and kidney were normal. On the left side an impassable obstruction was encountered at 6 cm. An excretory urogram was normal on the right, but there was no function apparent on the left. Urethroscopy revealed a normal bladder neck and urethra. Bilateral seminal vesiculograms were made and were normal.

On February 9, 1948, a transperitoneal left nephrectomy was performed. A biopsy specimen taken from the indurated area at the point of obstruction of the ureter showed a highly malignant adenocarcinoma. The findings in the upper urinary tract were a large hydro-ureter and hydronephrosis above the point of obstruction in the left side of the pelvis. Convalescence has been uneventful.

Comment.—The left ureterogram gave the impression of a suture about the ureter with attempted recanalization. It may be that the ureter was not injured and the obstruction was caused by the recurrent carcinoma.

CONCLUSIONS

Ureteral injuries are rarely incurred during the performance of pelvic surgery. The incidence is probably less than 3 per cent.

The ureter is most likely to be injured during the performance of those procedures requiring dissection deep in the pelvis. Controlling hemorrhage in the pelvis by clamping the uterine and inferior vesical arteries is a hazardous procedure and should be done with great caution.

The best prophylaxis is preliminary information concerning the pelvic ureters and visualization of the ureters at all times throughout the operation. The use of indwelling ureteral catheters is to be condemned as a routine practice because it gives the surgeon a false sense of security and invites additional complications.

In all cases of ureteral injury some provision must be made for establishing urinary drainage as early as possible, preferably at the time surgery is performed.

This may be done by nephrostomy, end-to-end anastomosis, or reimplantation of the ureter into the bladder.

We have not found it necessary to perform nephrostomy drainage and have successfully handled our cases by deligation and indwelling ureteral catheters, end-to-end anastomosis, and reimplantation of the ureter into the bladder.

We recommend conservative surgery and the preservation of the maximum amount of renal tissue, but we realize that in many cases the degree of hydronephrosis and infection is such that only nephrectomy can cure the patient.

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ABSTRACT OF DISCUSSION

DR. REX R. ROSS, San Antonio: Ureteral injuries are among the most frequent and serious of surgical accidents, being reported as occurring in from 1 to 5 per cent of pelvic operations and having a high mortality and morbidity rate. The majority occur during female pelvic surgery. Persistent urinary fistulas, hydronephrosis, hydro-ureter, sepsis, peritonitis, anuria and uremia, atrophic and dead kidneys are the result in a great many cases. In a series of 97 cases reported by 15 urologists and gynecologists and reviewed by me there were 24 deaths, 30 nephrectomies, 8 dead kidneys, and 9 persistent urinary fistulas.

Some injuries are unavoidable but many can be prevented. A preoperative urologic work-up is essential and likewise the preoperative use of ureteral catheters or exposure of ureters and careful dissection will reduce hazard to a minimum. Criticism by the essayists and Leventhal of preoperative catheterization of ureters on account of infection and creation of a false sense of security is not justified in my opinion.

Unilateral injury fortunately is the most frequent but bilateral cases are not uncommon.

The early recognition of injury is most important in the successful outcome. If the injury is recognized at the time it occurs and if feasible, an end-to-end anastomosis over a ureteral catheter used as a splint and for prolonged drainage probably gives the best results. When the injury is low, implantation into the bladder is indicated using the catheter as above. If there is pronounced hydro-ureter and hydronephrosis or severe kidney infection, and also in cases where implantation into the bladder has been unsuccessful, nephrectomy is to be preferred.

In bilateral injury, immediate nephrostomy, pyelostomy, or high ureterostomy ranks over deligation. In my opinion these procedures are less shocking than reentering the abdomen, and in some instances they allow recanalization of the ureter. Ligation of the ureter to create a dead kidney is bad as it is too unreliable and not without risk.

In case 3, I would have handled the injury by preliminary nephrostomy; in case 4 by ureteral dilatation and indwelling catheter. However, the results speak for themselves and the essayists are to be commended for their splendid results.

DR. JOHN ROBERTS PHILLIPS, closing: Most of the injuries to the lower ureters can be avoided if proper prevention is undertaken and carried out. The most important thing is to have adequate incision, good anesthesia (I prefer a spinal anesthetic because of the relaxation afforded), good lights, and careful anatomic dissection. The injuries, of course, are most likely to occur in the difficult cases of tubo-ovarian diseases, endometriosis, and interligamentous tumors, either cystic or fibroid. If the ovarian vessels are ligated high and dissection is carried downward over the ureter with the ureter under vision, there will be a minimum of chance of injuring it. If injury should occur, it can be taken care of at the time. In cases of malignancy where the ureter is caught into the process, it is possible that the mid portion might be resected and the ureter either reimplanted into the bladder or planted into the sigmoid. In these days when so many total hysterectomies are being done (in my opinion it is the operation of choice in every case where a hysterectomy is carried out, because of the incidence of cervical disease and of carcinoma arising in the cervical stump) urologists are bound to see more cases of ureteral injuries.

74. Injuries to the Lower Ureters, Secondary to Pelvis Surgery (Printed Texas State Journal of Medicine- February 1949, Vol.45, No.2) Co-authors: Michael K. O'Heeron and Anthony W. Miles. Pub. & Abst. Int. Surg. Digest Vol. 47 and June 1949.

75. Malignancy of the Lung, in Children & Young Adults (Report of 3 cases) Paper read before Texas Chap. of Chest Phys. Meeting San Antonio, Texas. 5-1-49

76. Carcinoma of the Lung- Methodist Hosp. Staff(With Ward Evans,MD)

An Analysis of 103 Consecutive Hysterectomies

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AN ANALYSIS OF 103 CONSECUTIVE HYSTERECTOMIES

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HOUSTON, TEXAS

In our last report[13], we collected a series of 191 consecutive hysterectomies performed by different surgeons of the staff of St. Joseph's Infirmary, Houston, Texas. It was deplored that the number of total hysterectomies was far below the desirable percentage, considering the many advantages this procedure offers for a lasting and satisfactory postoperative end-result. A perfect follow-up study of these cases handled by many different surgeons was, for obvious reasons, impossible. Would this have been possible, the incidence of unsatisfactory end-results after subtotal hysterectomy would undoubtedly be great. Therefore, we decided to analyze, in this report, a series of 103 consecutive hysterectomies performed by the senior author (Dr. John Roberts Phillips) in all private cases, in which careful follow-up studies were made.

As Table 1 shows, from a total number of 103 hysterectomies, there were 55 subtotal (53.4 per cent), 41 total (39.8 per cent) and 7 vaginal (6.8 per cent). This represents a recommendable ratio between the three different types of operations. Complete hysterectomy prevents future pathologic changes in the stump, of either malignant or benign nature, and should be the operation of choice, wherever indicated. Contraindications are

TABLE 1.

Hysterectomy	No.	%
Subtotal	55	53.4
Total	41	39.8
Vaginal	7	6.8
Summary	103	100

few: hysterectomy during pregnancy, or instances in which the operative hazard compels a short and conservative procedure.

The incidence of carcinoma in the stump after subtotal hysterectomy is generally believed to be from 1 to 2 per cent. It is, however, interesting to mention that Pearse-Schottlander, Herbert Spencer and Noble examined 900 uteri removed totally by operation, and although no gross or clinical evidence of malignancy was present, malignancy of the cervix was found microscopically in about 2 per cent. This statement should certainly make the surgeon "total hysterectomy conscious." Ward, in a very recent article, found the incidence of stump cancer as high as 4.1 per cent in a series of 4,269 subtotal cases; he mentions especially the frequent, and until then only little known, association of cancer with uterine fibroids.

Uterine fibroids and fibrosis, of course, represent the most frequent pathological condition in our series of hysterectomies as

TABLE 2.

Pathologic Conditions—	55 Subtotal No.	41 Total No.	7 Vaginal No.	103 Summary No.
(The total number of indications exceeds the number of cases because of multiple pathological conditions.)				
Uterine fibroids	23	23		46
Uterine fibrosis	12	9		21
Retroversion	5	3		8
Prolapse			4	4
Rectocele			5	5
Cystocele			6	6
Bicornate uterus	1			1
Endometritis	2	5		7
Cervicitis	1	10	3	14
Cervical lacerations		1	1	2
Cervical polyp	1	2		3
Endocervicitis	1	3		4
Carcinoma, body	1	2		3
Carcinoma, cervix	1			1
Ovarian cyst	1			1
Carcinoma, ovary	2			2
Tubo-ovarian abscess	2			2
Chronic pelvic inflam. dis.	4			1
Hydrosalpinx	3			3
Adhesions		1		1
Intest. obstruction	1			1
Ectopic pregnancy	1			1

shown in Table 2. The total number of indications given in Table 2 exceeds the number of cases, because the majority of them presented several pathological conditions.

It will be noticed that the data in Table 2 conforms with other reports. In Davis and Cusicks' series of hysterectomy, 72 per cent were done for fibroids; in Zullinger's series, 63 per cent. The latter, by the way, came to the conclusion that a greater percentage of the total hysterectomy group obtained complete relief of symptoms as compared to subtotal and vaginal hysterectomy.

In cases where endometritis, or any kind of cervical pathology of inflammatory or neoplastic nature was diagnosed, total hysterectomy was usually done. During the second half of this series, total excision of the uterus was by far more frequently performed in consequence of the previous experience gained by follow-up studies of subtotal cases. In many cases salpingectomy, oöphorectomy and appendectomy were done at the same time, but not listed as separate operations. Vaginal hysterectomy was performed in a small group only, and mostly for prolapse of the uterus with rectocele or cystocele. For fibroids we prefer always the abdominal route. We agree with Cogswell, that prolapse of the uterus without tumor formation is the chief indication for vaginal hysterectomy.

In Table 3 we have gathered the distribution of age groups for the various forms of

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hysterectomy. As might be expected, the abdominal route has its highest incidence between the ages of 35 to 45 years or less, while the vaginal group is generally composed of women who have passed the age of 50 years.

TABLE 3.

Age—	No. of Cases— Subtotal	Total	Vaginal	Series
20-35	17	12	1	30
36-45	18	17	2	37
46-55	3	6	0	9
56-65	2	1	1	4
66 and over	2	0	2	4
Not recorded	13	5	1	19

A word might be said about the form of anesthesia used in our cases. Although we are convinced that spinal anesthesia is of greatest advantage and, because of the complete abdominal relaxation obtained, should be the preferred anesthesia, we employed mostly

TABLE 4.

Type of Hysterectomy—	Anesthesia— Gas	Ether	Spinal
Subtotal	40	2	13
Total	29	2	10
Vaginal	7		
Summary	76	4	23

general anesthesia in the form of a selected gas (cyclopropane or ethylene), since a great number of patients influenced by public fairy tales, objected to spinal anesthesia. Ether was used only occasionally.

TABLE 5.—*Hospital Mortality.*

Hysterectomy—	No.	Mortality	%
Subtotal	55	4	7.2
Total	41	0	0
Vaginal	7	0	0
Summary	103	4	3.8

The uncorrected mortality rate in our series, as shown in Table 5 appears to be exceedingly high at first sight. The 41 total hysterectomies, as well as the 7 vaginal hysterectomies, were without any death. In the group of 55 subtotal hysterectomies, however, we had 4 fatal cases, a mortality of 7.2 per cent. This high percentage brought the mortality rate of the entire series up to 3.8 per cent. In one of these fatal cases the operation was a subtotal hysterectomy for uterine fibroids. The patient died of postoperative ileus on the seventh day. One patient on whom subtotal hysterectomy was done for bilateral old tubo-ovarian abscesses and a rectovaginal fistula, died on the fourth day of peritonitis. The other two fatal cases should be excluded from a corrected death rate, because they occurred in cases of advanced carcinoma. In one case after hysterectomy for fibroids, a carcinoma of the sigmoid was found on exploration. A resection of the sigmoid and a hysterectomy were done. This patient died nineteen days after the operation, from the carcinoma. The fourth fatal case was that of an advanced carcinoma of the left ovary. This patient had a resection of the sigmoid because of its adherence to the carcinomatous tumor. She died of postoperative hemorrhage. A corrected mortality in our series would be 1.9 per cent including the last two cases.

In our previous report we mentioned that it is incorrect to estimate the morbidity according to the days spent in the hospital until discharge, as the minimum stay in the hospital depends a great deal on the patient's financial status. Therefore, we abstain from making a detailed morbidity report. It must

TABLE 6.

Results—	Subtotal	Total	Vaginal
Leukorrhea	4	1	
Cervical Erosion	2	2	
Bloody Discharge	2	2	
	13	3	
	23.6%	7.3%	

be said, however, that we found no marked difference in morbidity between one type of operation and the other. Injuries to ureter or bladder, as so frequently observed by Murphy and others, did not occur in our series.

The follow-up studies of all the cases revealed some interesting pictures. In the vaginal group of 7, the postoperative end-results were satisfactory in all instances. The 41 total hysterectomies made further treatment necessary in only 3 cases (7.3 per cent); in 2 cases, a bloody discharge was present for two months and cleared up without special treatment; in 1 case a persistent leukorrhea had to be cared for. But in the subtotal group of 55 cases, the end-results were unsatisfactory in 13 instances (23.6 per cent), almost in 1 out of 4 cases. Leukorrhea was found in 4 cases, cervical erosions in 7, and bloody discharge in 2. Further treatment was necessary from one month to two years postoperative. In several instances additional operative procedures were necessary. Such a high incidence of disappointing results after subtotal hysterectomy should make total hysterectomy for malignant and benign conditions the procedure of choice in the interest of the patient and the surgeon as well.

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Medical Arts Building.

Metastatic Melanotic Sarcoma to the Ileum Causing Intussusception

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TUMORS of the small intestine, either of primary or of secondary origin are not common. The presence of a metastatic tumor in the mucous membrane of the small intestine is unusual. The case that I wish to report is one of a melanotic sarcoma primary in a mole on the face, which metastasized to the lymph nodes of the chest, to the ileum and to the thigh. The metastatic growth in the ileum presented itself as a cauliflower polypoid type of growth, which caused an intussusception. At post-mortem examination we felt that the patient was probably suffering from two primary malignancies from the gross examination because the polypoid tumor in the ileum appeared to be malignant and there was glandular involvement in the mesentery. However, on microscopic study it was found that the tumor was a melanotic sarcoma and that the character of the cells were identical with those of the primary growth.

REPORT OF CASE

The patient, a white female, age 38, consulted me first on February 27, 1941, because of an ulcerated area in front of the right ear, about the size of a nickel. This started as an ulceration on a mole, which had been present all of her life. Prior to coming to me she had had two X-ray treatments over this area and had had the lesion partially destroyed by electric needle. Due to the fact that the lesion would not heal she sought further advice. I felt that the process was a malignant one and examination of the glands of the neck revealed them to be enlarged. There was so much infection in the lesion I was unable to tell whether these glands were inflammatory or malignant. The entire sloughing area was removed with the diathermy loop and the area thoroughly cauterized, leaving a destroyed area about four centimeters in diameter. Within a week the glands in the neck were explored and found to be involved in a malignant process. The pathological diagnosis was melanotic sarcoma, so that a radical dissection of the glands of the neck, removing the submental, submaxillary and the deep cervical glands was carried out on the right side. The patient made an uneventful recovery. In about five weeks the destroyed area on the face had healed and the patient felt quite well. Her general examination at that time, including an X-ray of her chest, was negative. Due to the fact that she had had numerous attacks of biliary colic an X-ray was made and showed that she had gall stones. It was not felt advisable that anything should be done about this at that particular time. On January 8, 1942, or almost a year after the radical excision of the glands in the neck with the destruction of the tumor, the patient presented herself to me again because of a nodule that had formed in the mid-thigh along the course of the saphenous vein. It was about the size of a lemon and was rather fixed. It had a bluish discoloration to it, very much like there was a large hematoma present. Complete examination at that time revealed the head and neck to be negative. The scars were in good condition and there was no evidence of any recurrence in the glands of the neck. X-ray of the chest was negative. Her pelvic and rectal examination was negative, as was the abdominal examination. There was a tumor mass in the middle third of the right thigh along the course of the saphenous vein. I felt as though it could be a hematoma, but advised its removal. This was done January 9, 1942, and upon wide excision, staying wide of the tumor, it was found that it could be completely enucleated. It was entirely in the soft tissues and upon microcopic study it was found to be a melanotic sarcoma of the same character as the primary lesion. The patient made an uneventful recovery from this, but soon thereafter began to show rather marked anemia so that repeated transfusions were necessary in order to keep her blood up. It was felt that she probably also had metastasis to her liver, although nothing could be felt by abdominal examination. There was no evidence of any blood loss and X-ray examination of her stomach and colon revealed no evidence of tumor or ulceration. Her anemia was really very hard to control and she would have to be transfused, using 500 cc's of blood about once a week. Throughout this time, however, she never showed any evidence of blood loss and her general condition continued good, there never being any evidence of any cachexia or weight loss.

On June 23, 1942, she began to have rather severe upper abdominal pain without any distention and without vomiting. Her bowels continued to move normally. The pain was quite severe, requiring hypodermics for relief so that we felt that the pain was due to the gall bladder disease with stones. Due to the increase in severity and the difficulty in controlling the pain, on August 29, 1942, exploration of the abdomen was carried out, at which time

Submitted December 9, 1942.

cholecystectomy was done for sub-acute cholecystitis with stones. There were no stones in the common duct. Examination of the stomach was negative, as was examination of the liver. Examination of the mesentery revealed large glands which were quite definitely metastatic. There was no distention of the small bowel. Although a complete examination of the small bowel was not carried out, apparently at that time there was no definite obstruction and it was felt that the gall bladder was the cause of the patient's complaints. Following removal of the gall bladder, the patient was able to go home within ten days and continued to do well for a month, at the end of which time, she began having recurrent attacks of abdominal pain, intermittent in character, associated with nausea, vomiting and distention, so that we were then sure that she was suffering from an obstruction and by this time we were able to palpate a mass in the mid lower abdomen and could feel it by vagina. We felt as though the metastatic glands had progressed to the point where they were causing obstruction to the intestine. At one time the obstruction almost became complete, but by Wangenstein suction, enemas and intravenous fluids, we were able to relieve the obstruction so that she was able to return to her home within a few days.

For the last month of her life she was kept fairly comfortable with light diet and remained in her home up until the day before her death, at which time she was readmitted to the hospital with a definite obstruction and evidence of peritonitis. The mass in the abdomen had increased materially in size.

Post-mortem examination revealed no evidence of recurrence in the face or in the glands of the neck. There was a melanotic sarcoma in the hilar node of the right lung about the size of a lemon. The lungs were not involved in any metastatic processes. The stomach and duodenum was negative. A section of the liver revealed no metastasis. The biliary tract was perfectly normal. The gall bladder had been removed. In the lower right quadrant there was a rather large metastatic gland mass. The terminal ileum was rather markedly dilated and there was an area of intussusception. On opening the ileum it was found that there was a pedunculated polypoid cauliflower tumor in the terminal ileum which had caused an intussusception. The tumor mass measured two and one-half centimeters in diameter and was attached by a rather long pedicle. Grossly we felt that the patient was suffering from a second primary malignancy, but upon section of this tumor it was found that it was a melanotic sarcoma presenting itself as a polypoid growth. The glands were involved in the same melanotic process.

DISCUSSION

We had not been able to diagnose this tumor in the ileum before death. The X-rays had been negative except immediately prior to her death, there was evidence of rather marked intestinal obstruction. X-rays of the stomach and colon, as stated, had been entirely negative, and we were more or less at a loss to know just why the patient suffered from such a profound recurring anemia until we saw the post-mortem findings.

For about a week or ten days before her death she passed some black, tarry stools, so that we felt fairly certain that she must have some ulcerating or tumorous process in her intestinal tract somewhere, and in light of the findings it clarifies the cause for the recurring anemia.

I feel that this is rather an unusual case, both in the place of metastasis and the type of formation of the metastatic process. In retrospect, I am wondering if she did not have recurring attacks of intussusception, which relieved themselves, and that was causing her upper abdominal pain, which was interpreted as being due to the gall bladder. It is very difficult oftentimes to differentiate between acute gall bladder and acute intestinal obstruction clinically and when both are present at the operating table it is important that neither be overlooked. The symptoms of small bowel tumors are those of anemia and of obstruction.

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Total Versus Sub-Total Hysterectomy for Benign Lesions

BY

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Total Versus Sub-Total Hysterectomy for Benign Lesions*

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During the last few years the ratio of sub-total hysterectomies has changed considerably due to the advance of surgical technique. We notice that in former times the total form of surgical treatment was applied exclusively in malignant cases, while the sub-total hysterectomy was generally chosen for all benign conditions necessitating an operation. Now we find complete hysterectomy being performed not only in malignant cases but also for benign disturbances of the uterus as well. Recently this procedure is being accepted more and more. The switch toward total hysterectomy was only possible through the perfection of the operative procedure, and we owe tribute to the various medical centers for having prepared the way for a more liberal application of this type of treatment. The work of these large institutions was facilitated by a closed staff with strict principles regarding diagnosis and indications for operation. However, we feel that in the larger private institutions, where the doctors diagnose their cases and perform their operations in their own way, differing substantially from each other, the right attitude toward total hysterectomy has not yet been reached.

Of course the acceptance of total hysterectomy still varies to a large extent, as can be seen by the reports of various authors. The ratio obtained by Nelson and Weisberg from 14,591 operations, a compiled series of cases from their own experiences and from the literature, is regarded as commendable. This ratio of total to sub-total hysterectomies is approximately 1:2. In private hospitals we still find the ratio 1:4, 1:5, and even 1:6. The following table will portray the different opinions of various authors collected from recent literature:

TABLE I

Abdominal Hysterectomies

Authors	Abdominal Hysterectomies	Sub-Total	Mortality	Total	Mortality
Nelson & Weisberg	14,591	9,606	3%	4,985	3.56%
Tyrone	453	316	1.9%	137	2.2%
Harris	1,145	314	0.6%	831	0.6%
Masson	2,542	766	0.9%	1,776	1.2%
Phillips & Sears	173	141	1.41%	32	0%

We find, of course, that the greater the skill and experience of the operator, the lower the mortality rate will be. This can be applied in all types of operations, but this seems especially true in total hysterectomy.

Table II shows that in our own series of 191 consecutive hysterectomies performed by various surgeons of the active and courtesy staff of St. Joseph's Infirmary, Houston, we had 141 sub-total (73.82%), 32 total (16.75%), and 18 vaginal (9:43%) hysterectomies. The number of total hysterectomies is far below the point which we would like it to be. However, in a foremost private institution, as St. Joseph's Infirmary is, the principles of diagnosis, indication of operation and types of operation vary considerably due to the fact that every surgeon handles his cases individually, without commonly outlined staff principles.

TABLE II

	Number and Percentage	Avg. Age in Years	Morbidity (Days in Hospital)	Mortality
Sub-total	141 (72.82%)	38.0	13.1	1.41%
Total	32 (16.75%)	71.7	12.5	0
Vaginal	18 (9.43%)	56.6	13.2	0
Summary	191	40.6	13.1	1.05%

The average age of patients for all hysterectomies was 40.6 years, for sub-total 38.0, for total 41.7 and for vaginal 56.6 years. Under morbidity we mean the stay in the hospital until discharge. It was on the average 13.1 days. The difference of morbidity between one form and another was not marked at all. However, such an estimation of morbidity is not quite correct because the financial status of the patients plays a large part in the surgeon's advice as to the number of days which they should remain in the hospital. Out of 191 operations, we had two deaths (1.05%), both after sub-total hysterectomies, which brought the mortality of the latter up to 1.41%. The 32 total and 18 vaginal hysterectomies were without fatality.

Many surgeons are prone to pause in the action toward total hysterectomy for several reasons, and morbidity is one of them. They claim that risk, shock, morbidity and mortality are increased. This dubious question should easily be settled without a doubt, since the collection of facts given to us through competent and qualified surgeons prove to us that morbidity in total hysterectomies is not increased, and the end results are indeed more satisfactory.

This method of operation is not employed for the sole purpose of forebearing the contingency of later developing cancer in the stump, for if this were true, the total hysterectomy would be greatly limited, since the occurrence of cancer in the stump after sub-total hysterectomy in benign cases is only about 1%-2%. After a sub-total hysterectomy, patients frequently return to their doctor complaining that the desired relief which they expected from the operation was not satisfactory, or at least limited. Their disturbances at this point are mostly arthritic or myositic in character, and upon examination we find a leukorrhea due to cervicitis, which eventually requires another surgical intervention. It is only too natural that those

*Read before the Harris County Medical Society, Jan. 8, 1941.

patients change their doctor because they think their first operation was not successful. In this way a follow-up of post-operative results is greatly impaired, and we believe that the number of unsatisfactory end results after sub-total hysterectomy would be much higher, if a perfect follow-up of these cases were possible.

Quite frequently we find surgeons opposed to total hysterectomy because of their belief that in opening of the vagina the danger of infection is increased. This opinion is opposite to that of Masson, with whom we agree. Masson states that by applying a meticulous technique including surgical preparation of the vagina the danger of infection is diminished, because in "sub-total hysterectomy the cervical glands are cut across and often transversed by sutures" thus forming a focus of infection if the cervix was previously inflamed. Also cauterization and conization of the cervix cannot prevent infection as "those procedures leave a sloughing region continuous with the operative field and the peritoneum." Tyrone's opinion is as follows: "We are now performing the complete operation more often, not only because of the danger of malignancy in the remaining stump, but because a diseased cervix produces definite and annoying symptoms, whether the uterus is in or out of the patient." Richardson reported that on follow-up examinations of women who have borne one child or more 50%-75% were found with unsatisfactory conditions of the cervix or the lower birth canal. Therefore we cannot see an advantage in preserving the cervix in women near or at menopause, unless for some important reason.

Many surgeons object to total hysterectomy because they claim that succeeding the operation shortening of the vagina, diminished secretion of the vaginal mucosa and prolapse of the vaginal vault—all causes of dyspareunia—occur frequently. These objections are unjustifiable if the proper technique is used. Experienced surgeons who do total hysterectomies on a large scale reject these assertions, as well as those of injuries to the ureters, bladder and bowels; the latter may occur in inexperienced hands even with sub-total operations. For the skilled surgeon the technical difficulty of hysterectomy is not considerably greater in the average case. Only very obese women and those with an unusually deep pelvis make the operation somewhat more difficult.

Neither is the time factor ample reason to restrain from performing a complete hysterectomy, for the extended period of time is computed to be from three to ten minutes (three more minutes according to Nelson and Weisberg; five to seven more minutes according to Tyrone).

Therefore we would advise total hysterectomy in the following cases:

1. In women requiring hysterectomy for conditions of the corpus uteri who had one or more children by vaginal delivery.
2. In women requiring hysterectomy near or at the menopause with uterine pathology.
3. In all cases necessitating operation for conditions of the uterine body, where also the cervix is diseased.
   a. Lacerations.
   b. Inflammation (cervicitis).
   c. Benign cervical tumors (polys, cysts, etc.).
4. In all malignant cases of the uterine body.

For the advisability of sub-total hysterectomy we like to quote Richardson, who considers the following cases as suitable for this operation:

1. Women requiring hysterectomy for benign conditions, who possess perfectly normal cervices (mostly young women and nullipara).
2. Instances in which the operative hazard compels the execution of conservative surgery.
3. Cases where for good and sufficient reasons it is important to preserve menstrual function.
4. Most cases requiring hysterectomy during pregnancy.

A few words might be said about the adnexae. A total hysterectomy should be combined with a bilateral salpingectomy, because in this way the toilet and the peritoneization are greatly facilitated, the possibility of pelvic inflammation is diminished and the blood supply of the ovaries is improved, since there is not the increased strain of nourishing the tubes. It is, however, of paramount importance to preserve at least one or a part of one ovary according to the pathological involvement of the ovaries, whether the woman has passed menopause or not, as long as the ovaries are not completely atrophied. The ovary should not be fixed to the vaginal vault, but instead should be buried between the folds of the broad ligament in order to avoid dyspareunia.

Masson's technique for complete hysterectomy can be considered as outstanding, and recommendable. Here we can only briefly emphasize the most important steps of the operation. For more details we refer to Masson's excellent article in the April, 1940, number of the American Journal of Surgery. The operation is performed in the same way as for sub-total hysterectomy, only that in addition the bladder is freed way down from the cervix and vaginal vault. The cervix is then enucleated from the vaginal vault. As soon as the vagina is open, an iodine sponge

is inserted, to be removed after the operation. The vaginal vault is closed with a continuous mattress suture over the vaginal vault. After this the round ligaments are approximated and overlapped and secured to the vaginal vault, the tissues in the base of the broad ligament, the stumps of the uterine vessels and the utero-sacral ligaments. Peritoneization of the raw surfaces completes the operation. No drains are used. Employing this technique, an injury to the ureter, bladder and bowels can be relatively easily avoided. Neither will shortening of the vagina occur.

Concluding, we believe that with proper technique the risk of total hysterectomy is not much greater than in sub-total hysterectomy. The far better end results should make this operation much more popular than it actually is at the present time.

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THROMBOCYTOPENIC PURPURA

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THROMBOCYTOPENIC PURPURA

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THROMBOCYTOPENIC purpura is characterized by a diminution of the blood platelets. The first case was reported in 1735 by Werlhof. Brohm, in 1881, and Denys, in 1887, were the first to describe and emphasize that the essential finding was the lowered platelets in the peripheral blood. Hayem noted the normal clotting time and the absence of clot retraction. Duke, in 1910, showed the prolonged bleeding time. The first splenectomy for the condition was performed by Kaznelson in 1916.

Purpura hemorrhagica can be classified in many ways, but since we are only discussing thrombocytopenic purpura, we are limited to the symptomatic and the idiopathic type. Symptomatic purpura is that in which we find the purpura as an incidental finding or secondary finding along with the primary disease. This study was made on twenty-three cases, seven of these cases were of the symptomatic type and sixteen were of the idiopathic type. Eleven patients of the idiopathic type were splenectomized.

The various causes of the symptomatic type are: (1) blood dyscrasias, as leukemia, pernicious anemia, splastic anemia. In the series of cases studied there were three good examples of the type:

One was a four-year old white male admitted to the Hospital in 1941 with the symptoms of hemorrhages from the mouth and purpura. The blood findings were: platelets 11,500, white blood count 3,100 with 77 per cent lymphocytes, absent clot retraction, bleeding time five minutes. Splenectomy was performed; there was momentary rise in the platelet count, but the child did not improve. One month later the bleeding time was forty-nine minutes, the platelets 9,300, lymphocytes 88 per cent. One week later the white blood count rose to 39,000 with 95 per cent lymphocytes and the diagnosis of leukemia was made. This was confirmed at autopsy.

Another case, a seventeen-year old male was sent into the hospital as a case of purpura, but the diagnosis of leukemia was proved before splenectomy was contemplated. Still another was a twenty-year old white female admitted to the Hospital in 1938 with purpura and bleeding from the gums of three to four months' duration. Examination showed bleeding gums, purpuric spots, and a nonpalpable spleen. The tourniquet test for capillary fragility was positive, platelets varied from 10,000 to 30,000, white blood count ranged from 2,000 to 3,800, clot retraction was absent, bleeding time was four minutes. On sternal aspiration no cells were obtained. Splenectomy was performed. The spleen was of normal size with a smooth capsule and prominent corpuscles. After the operation the patient oozed and oozed, was given transfusions several times but the hemorrhagic symptoms continued.

All three cases bring out a very important point, namely, unless all the findings of purpura are present and no other abnormal blood findings are present, hesitate to operate. In the two cases in which the diagnosis was finally made of leukemia, there was a leukopenia with a relative increase in the number of lymphocytes. In the third case, leukopenia and a sternal aspiration revealing no cells indicated the diagnosis of a possible aplastic anemia, hence the splenectomy should have been delayed for further studies.

2. Acute infections are sometimes accompanied by purpura with a thrombocytopenia as seen in typhoid, pneumonia meningitis and occasionally with exanthemas. In this series there were two cases. One case was seen during the course of a rather septic pneumonia and the other in a small child with a large boil or carbuncle

of the neck. Both cases cleared rapidly with the healing of the causes of the thrombocytopenia.

3. Chronic infections also, are seen as a cause of a drop in the platelet count with resultant purpura. Tuberculosis and subacute bacterial endocarditis are the two chief offenders in this instance. There were no examples of this type in this series of cases.

4. Drugs are perhaps the most common cause of lowered platelet counts and the list of drugs which have been incriminated is a long one, but the most common are neoarsphenamine, quinine, sedormid, phenobarbital and the sulfonamides. An example of this is seen in a thirty-three-year old white female who was admitted in 1933 with a history of having intravenous injections for her syphilis for the three months previously. She had been menstruating for one month and on examination was pale, and had tenderness in the left lower quadrant. The white blood count ranged from 2,900 to 3,400; there was a marked anemia, the bleeding time was eight to fourteen minutes, the platelets were 4,000. She was given transfusions several times and the platelets slowly rose to 38,000. No follow-up was possible.

5. In cases of advanced malignancy with metastases to the bone marrow low platelet counts are sometimes seen.

6. In cases of splenomegalies such as Banti's, Gauchers or hemolytic icterus low platelet counts are detected. No cases of these last two types were seen in this series.

The idiopathic type of thrombocytopenic purpura is divided into two categories by the type of course they follow, namely, acute and chronic. The more common type of acute case is that which recovers for a while then goes on to a chronic form. Other forms are those in which there is a complete recovery and the patient is well completely. Some of these cases which appear as perfectly normal relapse after a varying length of time. Certain of the acute cases, in spite of all therapy, finally succumb, and in these cases various types of lesions may be found. One type of that which Rosenthal calls megakaryophthisis in which there is a marked diminution of the megakarocytes. In other cases one sees marked vascular changes with generalized small intravascular thrombi. In these fulminating cases the course of the disease may be very short as in the two cases reported by Denninger, wherein the entire elapsed time of symptoms was eight and one-half and eleven hours, respectively. In this series there were five acute cases with one fatality. This fatal case was one of the fulminating type, the child having symptoms for only thirty-six hours before the fatal termination. The other four cases recovered completely and left the hospital after transfusions.

The chronic type of idiopathic purpura hemorrhagica was seen in eleven instances and it is chiefly about these types of cases that this paper is concerned. This disease is most common in children and in young adults, especially girls. Of the sixteen cases, ten were in females whose average age was twenty-seven years. The etiology of the lowered platelets in these cases has been studied by many investigators and apparently there is more than one cause. Some of the workers believe that the vascular endothelium is injured and secondarily causes a fall in the platelets by causing their agglutination on the injured points. However, the majority of investigators are of the opinion that the essential factor is the platelets themselves and that they may be low in the peripheral blood because of poor production or by increased destruction. The lytic effect of the spleen on platelets was first suggested by Kaznelson in 1916. It is rather difficult to show phagocytosis of platelets in the spleen although it has been demonstrated. Poor production may be due to some substance elaborated by the spleen inhibiting the budding off of the platelets from the megakaryocytes, a sort of maturation defect; or it may be due to an actual depression of the megakaryocytes. This substance, thrombocytopen, has been demonstrated by Troland and Lee and recently

confirmed by Rose and Boyer. The majority of workers have been unable to confirm this.

The critical level of the platelets varies considerably in the opinion of various authors on the subject. However, in the great majority of cases purpuric phenomena occur when the platelet count is below 100,000. We believe that the best method for all practical purposes for the enumeration of blood platelets is the method of counting them in the blood counting chamber using a simple 3 per cent solution of sodium citrate as the diluent.

The symptoms of this disease are well known, they are: (1) hemorrhages into the skin, mucous membranes and internal organs. In these sixteen cases the most common site of the lesion was purpura of the skin and secondly, bleeding gums; (2) fever is not seen as a rule; though, in the acute cases this may be seen; (3) the spleen is only slightly enlarged although there are cases in which the enlargement has been pronounced; (4) when blood loss has been great, all the common symptoms of anemia will be present; (5) no adenopathy or hepatomegaly; (6) the white blood cell count is normal or there may be a slight leucocytosis with a normal differential or one which shows a slight increase in the polymorphonuclear count; (7) the platelets are diminished; (8) there is increased bleeding time; (9) absent clot retraction; (10) decreased capillary resistance, and (11) normal prothrombin time and coagulation time. This latter finding has been challenged by Nygaard who finds by his photo-electric technic that there is a delayed coagulation time in this disease.

In the chronic type, the platelets may be normal or decreased, though the capillary resistance and the tendency to bruise remain. One often sees exacerbations coinciding with the menses. Uterine hemorrhage may be the only symptom in these cases and the doing of the snake venom test is of differential value.

One should be on guard in those cases in which the amount of hemoglobin and red blood cells is too low compared to the actual blood loss and in which leukopenia is present. In these cases a very careful differential count should be done to rule out aleukemic leukemia. Furthermore, a study of the bone marrow is of great importance for several reasons: (1) to determine if there be any form of leukemia present; (2) if there be an aplasia of the bone marrow, and (3) if there be a normal decrease in the number of megakaryocytes. Reticulocyte counts are of value to determine if normal red cell regeneration is taking place. In this series three cases of purpura with a leukopenia were found (exclusive of the two cases of aleukemic leukemia) and in these cases the results were not good. One patient was operated upon with death as a result. The other two patients continued to have purpuric phenomena.

Since many of these cases have bleeding from the gums as a chief symptom, they go to the dentist first; therefore, it is of vital importance that the dentist be cognizant of the disease. Outside of the sternal marrow study, all tests can be performed with ease and and facility.

Wintrobe and his co-workers show that males as a rule recover from the first attack and hence the operation is more to be considered in females.

The differential of this disease is not hard if one recalls the necessary criteria that should be present. In the Henoch-Schoenlein type, joint pains and toxemia are frequent manifestations and these are not seen in the idiopathic type. Leukemia and aplastic anemia have been discussed. In hemophilia, there is a normal platelet count, normal capillary resistance, normal bleeding time and a marked prolongation of clotting time.

The spleen removed shows an endothelial proliferation of the Malpighian bodies and sinuses with an increase in the number of the reticulum cells throughout the whole organ. There is also seen an infiltration of polymorphonuclear eosinophiles and megakaryocytes. Occasionally, one sees phagocytosed platelets. In the bone marrow the

picture can be one of aplasia with megakaryopthisis normal with an anemia response of the red cell series or increased megakaryocytes with many young forms and poorly budding off of the platelets.

TREATMENT

Many types of medical management have been tried but most of them seem to have been of value only in the hands of the original investigators. Transfusion has been of value especially pre- and postoperatively and in the acute cases for whom operation is so dangerous. Many patients, especially children, have spontaneous remissions and remain well for the rest of their lives. This probably accounts for some of the results with some of the various medical methods of management in the acute cases. In some of the acute cases, the symptoms do not abate and one is forced into operating in order to attempt to save a life.

Treatment with calcium, vitamin C, vitamin K, horse serum, thromboplastin, foreign protein therapy, adrenalin injections, parathormone, *x*-ray and radium have all been tried with rather poor results in the hands of most of the men who have tried them. Snake venom has been used but there, too, the results have been none too good. But for a prognostic test the use of snake venom has been of some value. Cases in which the intracutaneous test became negative after treatment with snake venom responded well to splenectomy.

The most effective treatment is splenectomy. Ligature of the splenic artery was tried in two cases by Rosenthal and Berg and found to be of no value. As to preoperative care (1) be absolutely sure by all the tests at your command that this is a case of chronic idiopathic thrombocytopenic purpura, and (2) preoperative blood transfusion and preparation for postoperative transfusions should be provided. The operative technic will not be discussed except to mention one important point, namely, that no accessory spleen be left *in situ* to continue on with the mischief. Some of the poor results are undoubtedly due to overlooking this point. Hesitate before thinking too seriously of going back in to stop a bleeder that you imagine may be present in some of the more stormy cases.

The results in the acute cases in which operation was tried carried a much higher mortality (70 to 80 per cent). In chronic cases in which operation was performed the results were excellent with only 8 per cent mortality. In this series none of the patients with acute cases was operated upon. In the eleven chronic cases in which splenectomy was performed there were nine complete cures, one with symptoms remaining as before the operation but still alive after eight months. There was one death. The patient who died did not have as complete a workup as we would like to have seen in order to assess the case better. Two of the patients in this series had accessory spleens. The results of splenectomy as summarized by Rosenthal can be placed under the following groups: (1) complete recovery, (2) symptomatic recovery but platelets diminished in number, (3) complete recovery with a very high platelet count (thrombocythemia), (4) partial recovery with mild hemorrhages and thrombocytopenia, (5) persistent anemia with normal platelets and no hemorrhagic state, (6) unsuccessful splenectomy with partial recovery and then death, and (7) unsuccessful outcome with early postoperative death.

The following is the case history of a patient recently observed by us:

The patient, a nineteen-year old white female, three years ago first noted black and blue marks over her entire body. Thyroidectomy for hyperthyroidism was performed two and one-half years ago with no undue bleeding. One and one-half years ago she noticed a sudden increase in the bruising tendency. There never was any excessive menstrual flow. She was seen by several physicians and the following types of medical treatment were tried: blood intramuscularly, vitamin C, vitamin K, calcium and snake venom. After each new type of treatment there was an apparent improvement but the condition remained with her and

gradually became worse. Studies done at that time showed the following: platelet count never below 177,000, bleeding time seven to ten minutes, absent clot retraction, positive tourniquet test. Sternal marrow aspiration reported as normal.

When one of us (M. A. Z.) first studied her case she had the following: multiple ecchymoses, petechiae and some small hematomas. The spleen was not palpable. There was only a mild anemia. There was a normal white blood count and differential count and a normal bone marrow study. The bleeding time was six and one-half minutes. There was no clot retraction, a positive tourniquet test was present. The platelet count (chamber count) was 30,000. Splenectomy was performed several days later by one of us (J. R. P.). The spleen was just a trifle enlarged, the corpuscles were quite prominent. The platelet count postoperatively rapidly rose so that on discharge they were within normal limits; no new petechiae or ecchymoses developed. Today she is symptom free and her platelet count is normal.

SUMMARY

We have presented twenty-three cases of thrombocytopenic purpura, sixteen of which are idiopathic—the case for splenectomy. Eleven of these were chronic cases and were splenectomized. Seven were symptomatic and we believe that splenectomy in this group is not indicated.

The diagnosis is usually certain when care and attention is paid to the diagnostic criteria as set forth. Likewise when the diagnosis is certain splenectomy gives good results with small risk.

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EXCISION OF THE DUODENUM AND HEAD OF THE PANCREAS FOR CARCINOMA OF THE AMPULLA

METHOD OF ANASTOMOSING PANCREATIC DUCT TO THE JEJUNUM

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Diplomate of the American Board of Surgery

HOUSTON, TEXAS

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RADICAL surgery for carcinoma of the ampulla or head of the pancreas has now taken its place in their management. In a recent communication from Whipple he states that the case that I am reporting brings the total number of cases that have appeared in the literature, or have been reported to him, to about sixty-five, who have had radical surgery for carcinoma of the ampulla or head of the pancreas.

This patient presented an unusual problem in that upon his admission, he had evidence of an acute cholecystitis with a perforation of the gallbladder. At operation it was found that he had a gangrenous gallbladder, which had ruptured and bile ran free in the peritoneal cavity. There was a small liver abscess about two inches from the gallbladder. Everything was so indurated that nothing further than a cholecystostomy and a drainage of the liver abscess was carried out. There were no stones in the gallbladder. After a rather stormy course, his general condition improved. He was in the hospital about three weeks, during which time all of the bile drained out his cholecystostomy wound. No bile, whatever, went through to his duodenum. There was a lot of infection in his abdominal wall, which slowly subsided and after two months he was in such condition that it was decided that exploration of his biliary tract could be carried out. He was explored with a provisional diagnosis of a common duct stone obstructing the ampulla of Vater.

At operation the common duct was markedly dilated. It was opened and upon passing a scoop down to the ampulla, a soft mass could be felt, which was about the size of the end of the little finger. It felt like a soft stone, but nothing could be milked back. Because of this, the duodenum was then opened over the ampulla and a tumor mass could be seen. A section of this was taken and reported to be a Grade 2 adenocarcinoma. The tumor was destroyed by cautery and the duodenum closed. The common duct was then anastomosed to the stomach above the pylorus and the gallbladder removed, because it was so badly diseased that it could not be used in anastomosis. An anterior gastroenterostomy with an entero-anastomosis was made, the anterior operation being necessary because of adhesions and induration in the transverse mesocolon. The abdomen was drained. The patient, this time, made a very rapid and had a very easy convalescence. He was in the hospital about twelve days.

He, again, had a good deal of infection in his abdominal wall, so that the operation of radical excision had to be postponed again for six weeks. At the end of this time he was re-explored and the duodenum with the entire head of the pancreas was removed in one block. The pyloric end of the stomach was closed, as was the cut end of the duodenum near the ligament of Treitz. The pancreatic duct was ligated and the head of the pancreas was sutured with linen. A catheter was left into the raw bed and the space was further drained by a Penrose drain. He was given a blood transfusion on the operating table. The operation was unusually difficult because of the many adhesions and because of the persistence of a good deal of induration in the tissues. He stood the operation well. On the fourth post-operative day he developed a pancreatic fistula. For the first two days he drained 360 cc. Following that it decreased rather rapidly until at the end of the ninth day there was only 50 cc. drainage. This had completely stopped by the twelfth day, at which time he was allowed to go home from the hospital.

The functioning of the gastroenterostomy and the anastomosis of the common duct to

the stomach had been perfectly normal in every respect. There has been no jaundice and there has been no gastric retention. He is

Fig. 1. Shows the method of handling the common duct in the case reported.

eating well and feels fine at this time. He was strong enough to report to the office for dressing

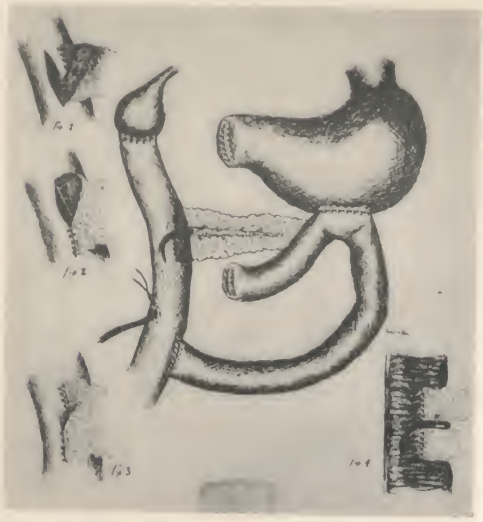

Fig. 2. Shows the proposed method of handling the pancreatic duct.

on the seventeenth postoperative day. There has been no interference from the loss of the pancreatic secretion. The bowels are normal and they have not been fatty. It has been the experience of Whipple that these patients are able to digest 80 to 85 per cent of a measured fat intake. In some cases, however, pancreatic extract and lipocaic have to be administered. This is particularly true if there are fatty bulky stools.

The pathological examination of the specimen revealed an ulcerating carcinoma at the ampulla, a centimeter in diameter. There was infiltration of all the layers of the duodenal wall. There was no infiltration into the pancreas and there was no lymph gland envolvement found. It was diagnosed adenocarcinoma, Grade 2. Due to the fact that this man is forty-four years of age and that he had a small lesion, it is hoped that he might be able to survive for a long time so that the effect can be studied throughout the course of several years.

Prior to Whipple's advocation of radical surgery for lesions in this area, only palliative procedures had been carried out. I was unable to carry out the procedure as advocated by Whipple due to the condition of the gallbladder and I realize that the operation of anastomosing the gallbladder

to the jejunum is a more scientific procedure. Due to the serious biliary fistulas that often develop after ligation of the common duct, Whipple now anastomoses the common duct to the jejunum. This is even a better procedure.

PROPOSED METHOD OF HANDLING PANCREATIC DUCT

Up to the present time the pancreatic duct has been ligated and dropped back. Whipple has anastomosed it to the posterior wall of the stomach. In the future I believe that it will be worth considering, and I plan to utilize this method of using a rather long loop of jejunum to anastomose to the common duct as a first stage. In this way the loop, after extirpation of the duodenum and head of the pancreas, can be swung over against the neck of the pancreas and the neck of the pancreas literally inserted into the side of the jejunum. In this way the loss of pancreatic digestion will not be complete, and in order to afford better healing of the pancreas to the side of the jejunum, I propose to insert a duodenal tube through the jejunum below the site of anastomosis, stitch the tube into the pancreatic duct and after returning the patient to the room, start suction, using the Wangensteen apparatus. This should keep the pancreatic and biliary secretions away from the area of anastomosis and allow healing to take place. In about a week or ten days this catgut suture should slough out and the tube then can be removed.

Carcinomas of the ampulla of Vater should be more favorable than carcinomas of the head of the pancreas for radical surgery for they metastasize more slowly. These lesions are often very small and unless at exploration the duodenum is opened and a biopsy taken, many operable lesions will probably be overlooked. I am sure that in my case I would have entirely missed the diagnosis, had I not opened the duodenum and taken a specimen for microscopic study. I urge that this be done in all doubtful cases.

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82. Excision of the Duodenum and head of the Pancreas for Carcinoma of the Ampulla Vatar. (Amer. J. of Surgery, Vol. LX No. 1 Apr. 1943, pp. 137-139.)

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BRONCHOGENIC CARCINOMA MASKED BY PULMONARY TUBERCULOSIS:

J. R. Phillips, M. D. CASE REPORT J. W. Morrison, M. D.

A double disease process is frequently the last possibility to be considered in a confusing diagnostic picture. The natural tendency to explain all findings, symptoms and complaints under a single disease entity, is not without its pitfalls. Then, too, the development of a second disease process, in addition to, and masked by, an older pre-existing process, creates an even greater challenge to the diagnostician.

Pulmonary tuberculosisand bronchogenic carcinoma, because of their common qualitiesof insidious onset, debilitation of the patient, the production of similar symptoms, such as cough, production of sputum, hemoptysis, chest pain, and so forth, and frequent similarity of roentgenograms, are a well-suited duet to masquerade as a single disease. Bronchogenic carcinoma may suddenly begin in a tubercular lung of long standing and progress for some time without detection, especially if the neoplastic lesion tends to mimic or blend into the original t.b. lesion.

The incidence of coexisting primary lung carcinoma and pulmonary tuberculosis probably occurs more often than is generally believed. Robins and Silverman state in their report of the literature that there have been more than 100 reported cases in American literature alone, since 1932. They add 12 cases in their report and fix the incidence of carcinoma of the lung in cases of tuberculosis at about 1.5 percent. As Feld and O'Malley have pointed out, the increase in bronchogenic carcinoma in recent years is probably due to better detection through improved diagnostic methods and a better concept of lung tumors,

rather than an absolute increase in the incidence of the neoplasm. This is undoubtedly also true of the incidenceof its coexistence with tuberculosis. There appears to be no conclusive evidence to show that tuberculosis predisposes to lung carcinoma, or vice versa.

According to Cooper, later workers - notably von Rokitansky. Lubarsch and Pearl - advanced a theory of antagonism between the two diseases; that the presenceof one disease "immunized" the patient against the other disease. However, this theory was later convincingly disputed by Moak, Carlson Bell and Oertel. Cooper concluded that the association of carcinoma and tuberculosis had best be regarded as coincidence in the light of our present knowledge of the etiology of malignant neoplasms. This view is the opinion shared by many in the literature. (Ross, Tudor-Edwards, Ritterhoff, Fulton and Rolleston and others.)

CASE REPORT

Mr. M. A. L. (Hospital Case No. 5020), a 39 year old white male, entered St. Joseph's Infirmary, July 10, 1949. He complained at this time, of a persistant cough, production of thick, blood-tinged sputum, a sharp pain in his left chest anteriorly, weight loss and marked fatigue.

The history of his trouble dated back four years - to early in 1945 - at which time he had consulted a physician in another city, because of a "slight discomfort and flu" in his chest. He had coughed up some blood-tinged sputum at that time. A chest X-Ray demonstrated an infraclacicular lesion in the left upper lobe, compatible with early primary tuberculosis. (See PLATE NO. 1). Patient stated that he "seemed to recover" from

this illness in a short time and he returned to work as a pipe-fitter.

In September of 1947, approximately two years later, he consulted an internist complaining of a sharp pain in the anterior chest, over a precordial area, coughing up blood-tinged sputum, and generalized weakness. The pain was steady and did not radiate. On physical examination, at that time, it was noted that he presented a thin, emaciated appearance. Bronchial breathing and a dullness to percussion were present, in the left upper chest, and there were some coarse rales over the entire left chest. Aside from these findings, the examination showed nothing else of note. An electrocardiogram was reported normal and a sputum examination negative for acid fast bacilli. A complete blood count showed a Hemoglobin of 120% with 5,810,000 red cells, 6,200 white cells and normal differential.

Chest X-Ray at this time revealed only slight change in original lesion seen in 1945. (See PLATE NO.2) The patient refused medical advise and attention of this lesion, and was not heard from again until June, 1949. At this time he saw a physician, complaining of the same anterior left chest pain. He stated that he had had pneumonia six months before (January, 1949), which lasted two weeks and after this he felt better and went back to work. He retained a slight cough productive of a small amount of thick yellowish sputum. He noticed that he became progressively more easily fatigued and that he had lost 26 pounds weight in six months time. He finally became so weak that he could not do his work. He did not take his temperature during this period, but felt that it was somewhat elevated at times, especially in the evenings.

In the interim from January to June 1949, the sputum was repeatedly blood-streaked and occasionally bright red and foamy.

The patient was bronchoscoped at this time and no abnormality observed. A Papanicoloau smear for cancer cells was negative. Serology, histoplasmin and coccidoidin tests were all negative. A tuberculin test using 1:1000 tuberculin showed a three plus reaction.

On admission to the hospital, (July 10, 1949) physical examination revealed a poorly nourished white male 39 years of age; B. P. 130/90; there was marked dullness in the left apex with rales heard both anteriorly and posteriorly in the left side throughout the lung field. The remainder of the physical examination was non-contributory. Laboratory work revealed 11.1 Grams or 66% Hemoglobin; Red Blood Count of 4,000,000; White Blood Count of 12,400; with Lymphocytes - 32; Monocytes - 3: Polymorphorucular leucocytes - 65; Urinanalysis showed a few Epithelial cells; 6-8 pus cells; Urobilinogen was present in increased amounts. X-Ray of chest (See PLATE NO.3) gave a definite indication of a neoplastic lesion in approximately the same area of the lung in which the tubercular process was discovered.

It was decided that after preparing the patient with several blood transfusions, an exploratory thoracotomy should be done with intention of removing the left lung if it proved to be an operable lesion. Exploration was accomplished through the sixth rib. The rib was removed. At operation, the lesion did appear operable, despite its rather large size, so a total left pneumonectomy was performed, removing the hilar nodes. Frozen sections showed them to be negative for carcinoma spread. It

was necessary to remove a considerable portion of the parietal pleura over the apex of the lung, together with the lung, because they were so closely adherent to each other. Individual dissection and ligation of vessels was done. The bronchus was closed with silk and covered with pleura. The patient was given 1500 cc's of blood on the table. The patient was discharged the 15th post-operative day in good condition. The pathologist's report of the surgical specimen (Fig. 4) described it as having "immediately beneath the apex - a rounded, firm, well circumscribed mass, measuring 8.5 cm in diameter, having a mottled, gray, yellow and red cut surface...." "one of the larger branches of the upper lobe bronchus contained soft, friable tumor tissue." ... "immediately adjacent to the tumor there was a cavity measuring 2 cm in greatest dimension which had an indurated wall. This contained yellow casseous material."

Microscopic examination (Fig. 5) showed the tumor to be a "rather poorly differentrated bronchogenic carcinoma of squamous cell type. The section from the wall of the cavity showed caseation necrosis, surrounded by some epitheloid cells and lymphocytic infiltration. Smears from the necrotic material were positive for acid-fast organisms."

An empyema required drainage the 5th day postoperatively. This patient's prognosis ordinarily would have been viewed with some degree of optimism since the tumor mass was peripherally located in the lung and no hilar nodes were found to contain neoplastic infiltration; however, the fact that it was so closely adherent to the parietal pleura over the dome of the lung, and that it was a rather large sized growth forced us to take a dim view of this patient's chance for survival.

This guarded prognosis has since been substanctiated on a routine post-operative checkup (September, 1949) by the appearance of metastic nodes in the supraclavicular region.

GENERAL DISCUSSION

In this case, we were pesented with an individual developing symptoms of pulmonary tuberculosis at age of 35. While the diagnosis of pulmonary tuberculosis was never absolutely established by positive sputum during the entire four years of his illness, his lung findings on X-Ray and physical examinat ion and his clinical course were fairly diagnostic of acid-fast infection. The finding at operation of acid-fast bacilli in a typical cavity proved this to be a correct assumption.

The fact that the disease course did continue over four years time bespeaks some priority for the tuberculosis, although both the tuberculosis and the carcinoma could conceivably have coexisted for the entire time. We feel, however, it is most probable that the cancer began within the last 6-12 months of his illness, if the final size of the tumor, and the lack of spread elsewhere, correlated with the clinical course, can be considered as criteria.

In 1949, chest pain, blood-streaked sputum, great weight loss, anemia and marked fatigue, out of proportion to his lesion, together with an X-Ray indicative of a neoplasm, forced us to consider bronchogenic carcinoma as our working diagnosis.

The fact that the patient was relatively young for bronchogenic carcinoma (In Fried's series - 13 cases; In Robbins and Silverman's series - 12 cases of coexisting pulmonary carcinoma and tuberculosis not one was younger than 45 years; that the tumor was peripherally located; that a negative bronchoscopic examination and a Papanicolaou smear were obtained plus a rather typical history

of tuberculosis - were all "herrings across the trail" in the diagnosis of the bronchogenic carcinoma. As Fried has suggested, bronchogenic carcinoma should be suspected to coexist with pulmonary tuberculosis, or exist by itself simulating tuberculosis, w when the patient past middle age develops chest pain and blood-streaked sputum, profound anemia, fatigue, weight loss, all out of proportion to the tuberculus lesion. Signs of further advanced cancer such as nodules of carcinoma in the clavicular region, presence of Horner's syndrome or distant metastes, paralysis of diaphragm and vocal cords, involvement of trachia, etc. easily make the malignant process apparent and also demonstrate an inoperable situation. Some surgeons, (DeBakey, Oshsner and Dixon) however, feel that paralysis of the diaphragm and vocal cords does not always indicate an inoperable case. Jaffe cites one of his cases in which the very first symptom to appear was a right lower quadrant pain simulating appendicitis. It proved to be a metastes to the iliac bone from a small bronchogenic carcinoma superimposed on bilateral tuberculosis. Very early diagnosis is paramount if the patient is to have a chance for survival. X-Rays of the chest, especially comparative studies, interpreted by a compentent Radiologist; remain the sine qua non of diagnosis of pulmonary diseases.

Watson, Pananicolaou, et all state that sputum and bronchoscopic washings for tumor cell presence will provide the correct diagnosis in about 60% of all cases of bronchogenic carcinoma and bronchoscopic biopsies (whenever a lesion is visualized) - 86% correct diagnosis. Other examiners (Woolner and Clerf) claim up to 90%. Early total pneumonectomy with removal of the hilar and mediastinal nodes is the only hopeful treatment of bronchogenic carcinoma.

The advances in recent years in thoraic surgery, anesthesiology and our knowledge of pulmonary physiology have made total pneumonectomy a relatively safe operative procedure.

SUMMARY

1. Bronchogenic Carcinoma may be easily masked by pulmonary tuberculosis.
2. The incidence of coexisting bronchogenic carcinoma and pulmonary tuberculosis likely occurs more often than is generally believed.
3. The association of the two diseases is probably coincidental.
4. A case report is given of pulmonary disease existing for a period of four years in which pneumonectomy was finally performed. Two diseases were found to exist in the same lung. The tuberculosis was thought to have preceded the cancer by a considerable period of time.
5. The problems encountered and methods used in the diagnosis are discussed.
6. Very early diagnosis and total pneumonectomy offer the only chance for survival.

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90. Case Summary of Adam Ballard (1954- in press.)

PROFOUND SURGICAL SHOCK, IRREVERSIBLE ?

FOLLOWING TOTAL ABDOMINAL HYSTERECTOMY FOR FIBROIDS AND EXTENSIVE PELVIC INFLAMATORY DISEASE

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A case was presented of a young negro woman, age 31, who had been having abdominal pain and discomfort, menstrual irregularity for the past 3½ years. Complete physical examination revealed multiple uterine fibroids filling the pelvis and coming up to the level of the umbilicus. In addition she had a very extensive cervicitis, grade IV, and hemorrhoids grade II. She was an obese individual, height 5 feet 4 inches, weight 195 pounds. Her general physical examination otherwise was negative. Her blood pressure was 130/90. The complete blood count showed 4,300,000 and hemoglobin was 67 percent with a normal differential count. The blood wasserman and kline tests were negative. X-ray of the chest was negative.

It was felt that she was in good physical condition to stand surgery. A hemorrhoidectomy, a conization, which was done to clear the purulent secretion from the cervix, so that when it was delivered to the abdomen there would be less likelihood of contamination and because at her age it was hoped that a Myomectomy might be possible so as to preserve her childbearing function. The anesthetic attempted was spinal. There was free exchange of fluid, however the spinal did not result in anesthesia, and the patient was put to sleep with cyclopropane. After the perineal part of the operation, the abdomen was prepared, and a wide slab of fat was excised from the abdomen, a Lipectomy. This was done to facilitate exposure. A complete abdominal examination revealed: a right

kidney which was somewhat smaller than the left. Complete abdominal exploration otherwise was negative, except for the large fibroids and extensive tubo-ovarian disease. A total hysterectomy was proceded with and there was a little bit more bleeding than usual from the broad ligaments due to the extreme adherence of the pelvic structures. There was some difficulty with the anesthetic with some cyanosis, intermittently throughout the operation. However the anesthetic was satisfactory. At no time did her condition become unfavorable on the operating table. We had 500 cc of blood available, but did not feel that it was necessary to give it, until she returned to her room. It was estimated that about a pint or maybe three-fourths of a pint of blood was lost, during the operation. She returned to her room with blood pressure of 120/70, and was looked upon as being in a satisfactory condition. Transfusion of 500 cc of blood was started immediately and for the next one hour and a half this blood ran in. At the completion of the blood transfusion it was noticed that the patients condition was not as satisfactory. There was some cyanosis and the pulse was more rapid. Half an hour later the surgical supervisor was called and at that time she notified me. Blood pressure at that time was 80/40 and pulse about 140. Oxygen was immediately started and preparation for further administration of fluid was made, in the form of glucose and further blood was ordered. At 5:30 p.m., I arrived on the scene, about 30 minutes after being called, and found the patient in an extreme condition, pulseless, heart action was regular, heart tones of good volumn, pulse about 140. We elevated the foot of the bed, and immediately started intravenous fluids and in a few minutes another pint of blood was available. To get it to go more rapidly we cut down on the anti cubital vein, and during the course of the next hour and a half, to two hours, 1500 cc of blood more were administered, together with about 500 to 1000 cc of glucose solution. Three-

eighths of a grain of ephedrine was given intravenously without any response in blood pressure at all. Also adrenaline and adrenal-cortix were administered without any shown effect. The patients condition remained about the same and she finally expired at 1:30 A.M., the following day or eleven hours post-operatively.

By way of discussion, the diagnosis was profound, irreversible surgical shock. By way of discussion, fat embolism, some blood discretion, or some unknown incompatibility of blood was discussed. Dr. Chappell gave the post-mortem findings. Dr. Bonham gave a splendid report of the process and emphasized the administration of blood hurries the patient on out, and suggested that it would have been better if plasma had been given, along with the blood. Dr. Karbach emphasized the importance of giving cold blood. Dr. Chappell replied by askihg that no one attempt to warm the blood because it might cause coagulation of blood. Dr. Lawrence gave a very fine discussion about methods of treating shock, made certain suggestions. Dr. Pittman felt as though, more blood should have been given, and we agreed that it would have been advisable to have given more blood, more rapidly and to have helped restore the blood volumn. Dr. Paul Ledbetter discussed the medical aspects and stated that the important thing was to prevent shock, and that often times once it had developed, that it was difficult to control. Dr. Charles Hallson, whose remarks were discussed briefly and commented upon by Dr. Hamarick, felt that more fluid probably would have been better than giving too much blood. Dr. Heard felt that the amount of surgery in a patient who is obese, without any attempt at reduction, was probably too much.

However, we constantly do perineal repairs in-conjunction with total hysterectomys and in summarizing I feel like the error that was made, was that we didn't

give blood during the operation and immediately thereafter. Once the shock became apparent, I feel that the error was made in not giving more blood more rapidly, under pressure. One of the residents stated that there was apparatus for giving blood rapidly in the obstetrical department, apparatus for giving blood under pressure. I feel like that we may have been able to save her if we had given 1500 to 2000 cc of blood in a very short time, 15 to 20 minutes, in order to have restored the blood volumn. All in all, it was a very fine discussion. I feel like the staff has benefited a great deal from the discussion.